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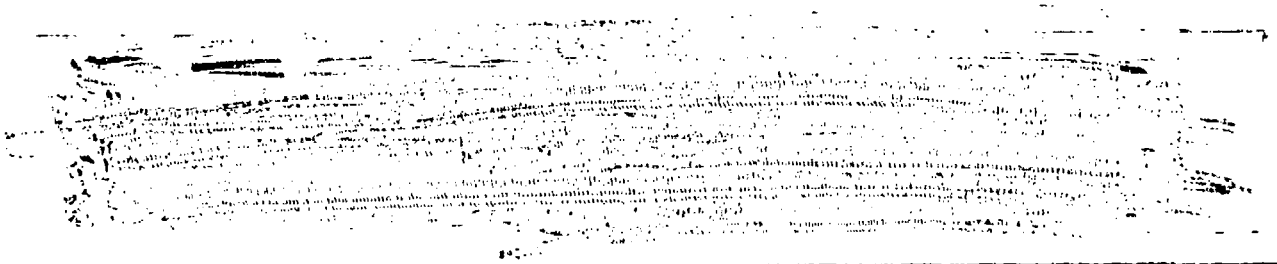

A Study of the Effect of CATASTROPHE ON SOCIAL DISORGANIZATION

by

Leonard Logan
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University of Oklahoma
Research Institute

Work Completed: 23 Dec 1951
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THIS IS A WORKING PAPER

Presenting the considered results of study by the ORO staff members responsible for its preparation. The findings and analysis are subject to revision as may be required by new facts or by modification of basic assumptions. Comments and criticism of the contents are invited. Remarks should be addressed to:

The Director
Operations Research Office
The Johns Hopkins University
6410 Connecticut Avenue
Chevy Chase, Maryland

ORO abstract

A STUDY OF THE EFFECT OF CATASTROPHE ON SOCIAL DISORGANIZATION

by

University of Oklahoma Research Institute

This is the first of a series of studies in which, in the absence of actual combat experience, the reactions of troops to atomic attack are extrapolated from the observed behavior of civilian groups in disasters. The bases for this study are the April 1947 Texas City explosion, four towns hit by tornadoes, and a holocaust fire. The analysis indicates that:

- Social reorganization after a disaster follows certain patterns: (a) The individual tends to act in terms of those social values which seem to him most threatened; (b) small groups begin to emerge on the basis of concern with a common problem; (c) as communications are reestablished, leadership coordinating small groups emerges.
- In the case of troops under atomic attack, previous organization and training may counteract to some degree the initial complete disorganization, at least in the areas of moderate and slight damage.
- Panic can be prevented best by rapid transmission to individuals of accurate information as to the sources of danger and as to appropriate action to escape existing danger.

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Technical Memorandum ORO-T-194

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Project ATTACK

OPERATIONS RESEARCH OFFICE
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ACKNOWLEDGMENT

This memorandum is the product of the combined efforts of members of the Institute of Community Development and the Department of Sociology, both of the University of Oklahoma. Full responsibility for planning the research, coordinating the efforts of the various workers, and attending to the many administrative details necessary in such a project, was assumed by the Director of the Institute, who was also Director of Research for this project.

The theoretical frame of reference and the plan of procedure were products of the collaboration of the Director; of Lewis M. Killian, Chief Field Investigator and Assistant Professor of Sociology; and of Wyatt Marrs, Professor of Sociology.

Construction of schedules, collection of field data, and the actual writing of the report were the work of Dr. Killian. In the collection and analysis of the data he was assisted by Mr. Thos Sark and Mr. James Giffin, research assistants and graduate students in the Department of Sociology. Mr. C. A. Creveling, draftsman for the Institute of Community Development, prepared the maps in collaboration with Dr. Killian. The editing of the report for scholarly style and grammar was the work of Professor Wyatt Marrs.

Leonard Logan
Director of Research

23 December 1950

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SUMMARY

SUMMARY

PROBLEM

To investigate the reactions of troops to atomic attack by extrapolation from the observed behavior of civilian groups in disasters and troops in conventional warfare.

BACKGROUND

In the absence of actual combat experience, and before such experience occurs, it became evident, with the advent of the first atomic weapons in the war against Japan, that the psychological reactions of troops under atomic attack would be an important factor in the behavior of troops in atomic warfare. This is the first of a series of studies in which civilian disasters are examined for common indicators concerning behavior training, organization, and control which could be extrapolated to military atomic situations. Additional benefits from such studies were anticipated in the form of possible solutions to civil defense problems in atomic warfare.

DISCUSSION

In this study, analysis has been made of social responses to the April 1947 Texas City explosion, tornadoes in the towns of Woodward, Antlers, Holdenville, and Sasakwa, Oklahoma, and a holocaust fire in a dormitory at the University of Oklahoma. Attention has been given (a) to the reactions of participants; (b) to the functioning of already existing disaster control organizations; and (c) to the problems of individual and group rehabilitation.

These case studies were made by a research team which visited the disaster areas and made every effort to locate key

informants who, together, could give an authoritative account of what took place in different parts of the disaster area, at different stages of the disaster, and in different phases of relief and rescue activities. A particular effort was made to locate leaders, both established and emergent.

Extrapolation to the reactions of troops to atomic attack is based on information in The Effects of Atomic Weapons (U. S. Scientific Laboratory, Los Alamos, and U. S. Atomic Energy Commission).

CONCLUSIONS

(1) Social reorganization after a disaster follows this pattern:

(a) The individual at first tends to act in terms of those social values which seem to him most threatened.

(b) Small groups begin to emerge on the basis of concern with a common problem. Leader-follower relationships develop spontaneously.

(c) As communications are reestablished, leadership, controlling several small groups, emerges. This is most successful if the relationship is that of coordination.

(2) The first 15 to 30 minutes after a disaster is the critical period during which fateful decisions must be made in the face of a totally new unstructured situation.

(3) In the case of troops under atomic attack, previous organization and training may counteract to some degree the initial complete disorganization, at least in the areas of moderate and slight damage.

(4) Panic can best be prevented by rapid transmission to individuals of accurate information as to the sources of danger and as to appropriate action to escape actually existing danger.

(5) Plans for meeting disasters should be flexible, inclusive as to personnel and broad as to area, and should include arrangements for prompt provision of essential supplies, the locations of which are known to all.

A STUDY OF THE EFFECT OF CATASTROPHE ON SOCIAL DISORGANIZATION

REACTION TO DISASTER:

OBJECTIVES AND SCOPE OF THE STUDY

Few people expect disasters to happen -- not to themselves, at any rate. The very essence of disaster is that it is unexpected, a violation of man's normal expectations as to the probable course of the next hour, the next day, or even of his whole life. In war, itself a catastrophe, the probability of disaster is regarded as greater than in a state of peace, but security measures are taken then to eliminate the frustrating effects of chronic apprehension. Yet, in both war and peace, disasters such as bombings, breakthroughs, explosions, tornadoes, floods, and holocausts, occur with sufficient frequency to indicate that they should be expected and prepared for.

This is a study of the effects of catastrophe on social organization among civilian groups, with the ultimate aim of extrapolation to military situations. Its objectives are:

1. To determine the effect of catastrophic situations on the behavior of military personnel;

2. To make recommendations concerning effective training and organizational measures that will tend to minimize disorganization, both in extent and in time;

3. To establish criteria for military control of civilian populations in combat zones.

Its method, in broad outline, was to study civilian groups in catastrophic situations roughly comparable to disasters which might strike military groups during wartime. As a result of the frequency of civilian disasters even in peacetime, primary data are available for this type of study. But in order to make predictions and recommendations for military situations, the use of secondary materials and logical deductions are also required.

THE SCOPE

In order to attain the general objectives of the study, six phases, or sub-problems, were included in the scope of the project. Some of these problems were studied extensively. A preliminary investigation of the other problems was made, but further study, particularly that of an experimental nature, is indicated. The nature of each of these sub-problems and the progress made in its investigation are outlined below.

The Study of as Many Communities as Possible that Have Experienced Disasters, such as Tornadoes, Flash Floods, Holocausts, and Explosions, in order to Ascertain the Resulting Behavior Patterns

This objective was the central and primary phase of the research project. As a direct contribution to this problem one explosion city (Texas City), four tornado towns (Woodward, Antlers, Holdenville, and Sasakwa, Oklahoma), and one holocaust (dormitory fire at the University of Oklahoma) were studied intensively. The major portion of this report will be devoted to case studies of these situations and analysis of the data obtained therefrom. These case studies also provide significant data relating to the other phases of the project. These data are of particular value in indicating the variables to be included in projected experimental studies.

The Study of Methods of Training in the Recognition of Signs of Disaster and in Providing Learned Adjustments Adequate to Meet Impending Threats

Although the disasters studied were of such a precipitate nature that most of the people involved had no opportunity to recognize signs of an imminent catastrophe or to make any appropriate adjustments, a few individuals anticipated the disasters. Post-disaster investigations indicate, moreover, that experiencing a disaster constitutes a sort of training. Hence it was possible to secure data concerning the means by which impending disasters were recognized, the types of adjustments made, and the effects of experiencing a disaster on subsequent reactions to real or apparent threat. Experimental study of this problem is indicated.

The Determination of Individual and Group Reactions to Special Psychological and/or Sensory Disturbances as a Function of the Extent and Kind of Training

Again, experimental study of this problem is needed. Data were obtained, however, showing some effects of disaster experience on reactions to special disturbances of a psychological or sensory type.

The Study of Communities Organized for Disaster Control for Extrapolation to Military Situations

The most illuminating study of disaster control organizations is the study of organizations that have been put to a test in an actual catastrophe. Three of the five communities studied had some sort of disaster control organization, and the functioning, or failure to function, of these organizations is analyzed in this memorandum.

The Study of Methods of Rehabilitation

Every disaster culminates in a stage of individual and group rehabilitation. Investigation of the methods of rehabilitation used was one aspect of the study of the disasters described in this report. The focus was upon the problems of physical and economic rehabilitation, and further study of psychological rehabilitation is needed.

An Outline of Methods to Predict the Probable Behavior of Enemy Troops under Atomic Attack

This is a problem in extrapolation from the peacetime behavior of United States civilians to the wartime behavior of non-United States troops. At the present stage of the study, however, extrapolation to the behavior of troops of a culture similar to that of the United States is all that is possible. Further study will be required to outline methods of prediction which take into account cultural differences. Secondary materials on the culture of specific peoples and the behavior of their troops in pre-atomic wars should be used.

ORGANIZATION OF THE REPORT

The major portion of this report will be devoted to a presentation of the data obtained in field studies of disasters which have occurred in Oklahoma and Texas since 1945. A necessary

preliminary to these case studies is a comparison of the behavior of civilian groups studied with that of military units, which is the matter of ultimate interest. Because of the magnitude of the catastrophe and the marked similarity to an atomic explosion, the Texas City ship blast receives extensive treatment. The accounts of disorganization and reorganization in tornado-stricken towns is briefer, as will be the story of a fire in a men's dormitory. A separate chapter will be devoted to "Reactions to Threat," including a discussion of the recognition of signs of disaster, adjustments to impending disaster, reactions to special disturbances as a result of disaster experience, and a short description of a community in a situation of chronic threat. Data presented in these case studies are summarized and analyzed in "Civilian Reactions to Disaster.". The significance of the previous findings for military situations is discussed in "The Military Problem."

The case studies presented in this report are based on data collected by a research team of three members. Prior to engaging in field research, the members of the team familiarized themselves with the story of the disasters as presented in newspaper accounts and other published sources. In the communities no effort was made at statistical sampling, because of lack of time, the limited number of workers, and the fact that the universe from which a sample could be selected would be different from the one existing at the time of the disaster. Every effort was made, however, to locate key informants who, together, could give an authoritative account of what took place: (a) in the different parts of the disaster area, (b) at different stages of the disaster, and (c) in different phases of relief and rescue activities. A particular effort was made to locate leaders, both established and emergent. Intensive, non-directive methods were used in interviewing these informants. The type of questions to which answers were sought are given in Appendix A. Despite the lapse of from six months to five years between the time of the various disasters and the time of the research, it is felt that a reliable picture of the over-all reactions of each community to catastrophe was obtained.

In the following chapters, personal statements quoted are taken from field notes unless otherwise indicated.

CIVILIAN AND MILITARY GROUPS IN DISASTER

In order to make reasonably valid extrapolations to the behavior of military personnel from the study of civilians, it is essential to consider the similarities as well as the differences between the two types of groups. It is easy to overemphasize the differences, and difficult to perceive the less obvious but more fundamental similarities. It is a truism, nonetheless worth stating, that both soldiers and civilians are human beings, with many common motivations and experiences.

With one exception, the civilian groups studied were small communities, all of them far away from any combat zone. Therefore comparison of small United States communities and military units is appropriate. The communities studied in this project ranged in population from approximately 1,000 to 16,000 persons.

An obvious difference is to be found in the age and sex composition of civilian and military populations. The civilian community includes a broader age range than does the military unit. Of particular significance is the inclusion of children in the civilian population. This suggests another obvious dissimilarity: the greater proportion of women in the civilian community. The existence of the Women's Army Corps suggests, however, that women may constitute a considerable element in the population of communications zone units, although not of combat zone units. It is difficult to make a precise comparison in the matter of racial and cultural heterogeneity. Both civilian and military groups vary in degree of heterogeneity, largely as a function of size. Fortunately, the civilian communities studied ranged from Woodward, Oklahoma, with an almost exclusively native white population, to Texas City, with sizeable Negro and Latin-American groups. The fact that the latter groups are segregated residentially in Texas City provides some clues as to the effects of segregation on group reaction to a community-wide disaster.

The most important features of the two types of groups to be compared, however, are their social structure and their psychology.

THE SOCIAL STRUCTURE OF CIVILIAN COMMUNITIES AND OF MILITARY UNITS

In the typical civilian community, the basic social unit and the most important primary group is the family. Even though the members of the family may spend most of their waking hours apart, it is this group in which the average individual is most likely to be emotionally involved. Again, although the members may be scattered throughout the community at the moment of impact, a disaster represents a real or potential threat to all.

It is one of the pre-eminent characteristics of military groups that the individuals composing them are spatially distant from their families. This does not mean, however, that the soldier has no ego-involvement in some small, primary group. It is an old army adage that morale and esprit de corps begin in the squad. Muzafer Sherif, an eminent social psychologist, made a thorough study of the formation of small in-groups in army units, utilizing the writings of such a keen observer as Ernie Pyle. Sherif writes:

> Just as in-group attitudes are formed by the child in connection with his family, just as the closely knit sorority or fraternity group marks off its own group from others, so the army unit becomes the center and focus of the men's experience and activities.[1]

The small military units, such as the squad, the platoon, and friendship cliques within units of this type, are the military surrogates of the family, both as the basic units of social organization and as the primary locus of emotional involvement.

The army is composed of units arranged hierarchically along a single vertical axis, while the civilian community approximates a horizontal structure of many independent and sometimes conflicting groups. The soldiers' loyalty to the smallest unit of

[1] Muzafer Sherif, An Outline of Social Psychology (New York: Harper and Brothers, Publishers, 1948), pp. 102f.

which he is a part is, automatically, loyalty to the larger units in the hierarchy and ultimately to the whole army. The civilian may belong to a family group, a work group, a civic club, a church group, and many others, at the same time that he is, willy-nilly, a citizen of the community. Even in normal times, the problem of conflicting group loyalties is a recurrent one for the modern United States civilian. There remains, however, a basic similarity between the structure of both civilian and military society, namely, that the most intense loyalties tend to be directed towards the small, primary groups, whatever they may be.

It follows from these differences in military and civilian group structure that there are differences in the systems of authority. Military authority is centralized and clearly defined. Authority in the civilian community tends to be diffuse and vaguely defined, regardless of the size of the community. Even police jurisdiction in a small community may be divided between city police, the county sheriff's force, and state police. Officials of industry often constitute a powerful but separate source of authority for many individuals in a community. Equal in importance to the diffusion of civil authority is the fact that community officials in most cases occupy their positions at the behest of the citizens, even though they may not be elected officials. Their ultimate source of authority is the people whom they are supposed to lead. Not infrequently this source is withdrawn, because of demonstrated incompetence or political controversy, and their leadership becomes merely nominal.

In contrast, the military leader is vested with authority by someone higher than himself or his subordinates. He is less likely to be disregarded by those whom he is supposed to lead. By the same token, the military commander is likely to have more confidence that he will be obeyed and followed than is, for example, a mayor who may know that he was elected by a small majority. Finally, in military society the patent and direct exercise of authority is part of the normal, daily routine. In civilian life, authority is exercised more indirectly and the average citizen is unaccustomed to, and somewhat resentful of, its unveiled manifestation. In short, the United States community, regardless of actual practices, is expected to operate on democratic principles, while military organization rests ultimately on authoritarian principles.

Furthermore, the soldier in the combat zone differs psychologically from the civilian in the peacetime community in the way of expectations and motivation. While the occurrence of large-scale disaster is not expected by the soldier, its likelihood is recognized as greater. Violence, serious injury, and death for some members of the group are part of the normal expectations in combat. The civilian, in peacetime, not only does not give serious thought to the possibility of a catastrophe, but he does not expect to be confronted with scenes of violence and death. Obviously, the military personnel in the Communications Zone approximate more closely the civilian community in their expectations.

Many of the motives of civilians and soldiers may nevertheless be expected to be the same, despite differences in situations -- the basic biogenic motives contributing to the preservation of life, the need for belongingness, and the desire for status.

The military concept of "mission" best describes the most sharply contrasted civilian and soldier motivation. A military group has a combat or logistical mission which it is supposed to accomplish in spite of disaster. If no more is possible, reorganization for defense becomes the mission of the stricken unit. But to the civilian, peacetime disaster is not the prelude to attack by an aggressive enemy pursuing an advantage. Normal missions of production, distribution, education, and other civilian pursuits are abruptly suspended in a disaster. Rescue, relief, and the prevention of further death and destruction become the primary missions of the civilian community. While the speedy resumption of normal activities is a goal, it does not have the urgency of the military mission.

In spite of the existence of these differences, however, military and civilian groups involved in disasters have two important elements in common. The first is that the disaster, whatever its nature, constitutes a violation of normal expectations. Despite allegations as to the unpredictability of human affairs, men live on the basis of predictions, of normal assumptions as to what is going to happen next. The fundamental psychological feature of the social disorganization which follows a disaster is that men do not know what to expect next, for their usual assumptions are evidently inappropriate. The second common element is that in the destruction and deprivation which a disaster entails, bio-

genic motives, the sheer preservation of life, assume unusual importance. Attention to the socially derived superstructure of cultural values and norms, such as the accomplishment of a military mission, or concern for property and the normal needs of civilian life, must compete with the demands of physical survival.

TEXAS CITY: EXPLOSION PORT

The people of the thriving Gulf port and industrial center of Texas City, Texas, awoke on 16 April 1947 to a day that promised to be distinguished only by its bright, briskly cool weather. At 0800 the day-shift workers went to their jobs in the plants and on the docks. About 0830 the volunteer fire department answered a call to a ship fire in one of the port's two slips. (See Fig. 1.) While many curiosity-seekers went to the waterfront to watch the fire, the school children went to their classrooms at nine o'clock and housewives began their shopping on the city's main street, a safe three-quarters of a mile from the fire.

At 0912 the burning S. S. "Grandcamp" disintegrated in an explosion that blew many of the workers into bits, killed 27 firemen, showered the school children with glass and falling plaster, and decapitated a shopper as she walked along the street. It also started fires that burned for a week, disrupted communications, power, and water facilities, and reduced the city to a state of disorganization and confusion. At 0110 the next morning the S.S. "Highflyer" blasted from its moorings and set afire by the first explosion, went up in a second blast. The final toll after the two explosions was 512 persons dead or missing, nearly 4,000 injured, and property damage amounting to over seventy-six million dollars.

The story of the Texas City disaster, one of America's largest peacetime catastrophes, has been told many times. Careful study of these accounts reveals that one of the outstanding features of this disaster is the fact that rarely are two of the stories alike. Some of the confusion that reigned for hours after the first blast still conceals exactly what did happen at Texas City on that fateful day.

Because of the tremendous property losses involved and the grim suggestion of danger to other port cities, the physical aspects of this catastrophe have received careful, scientific study.

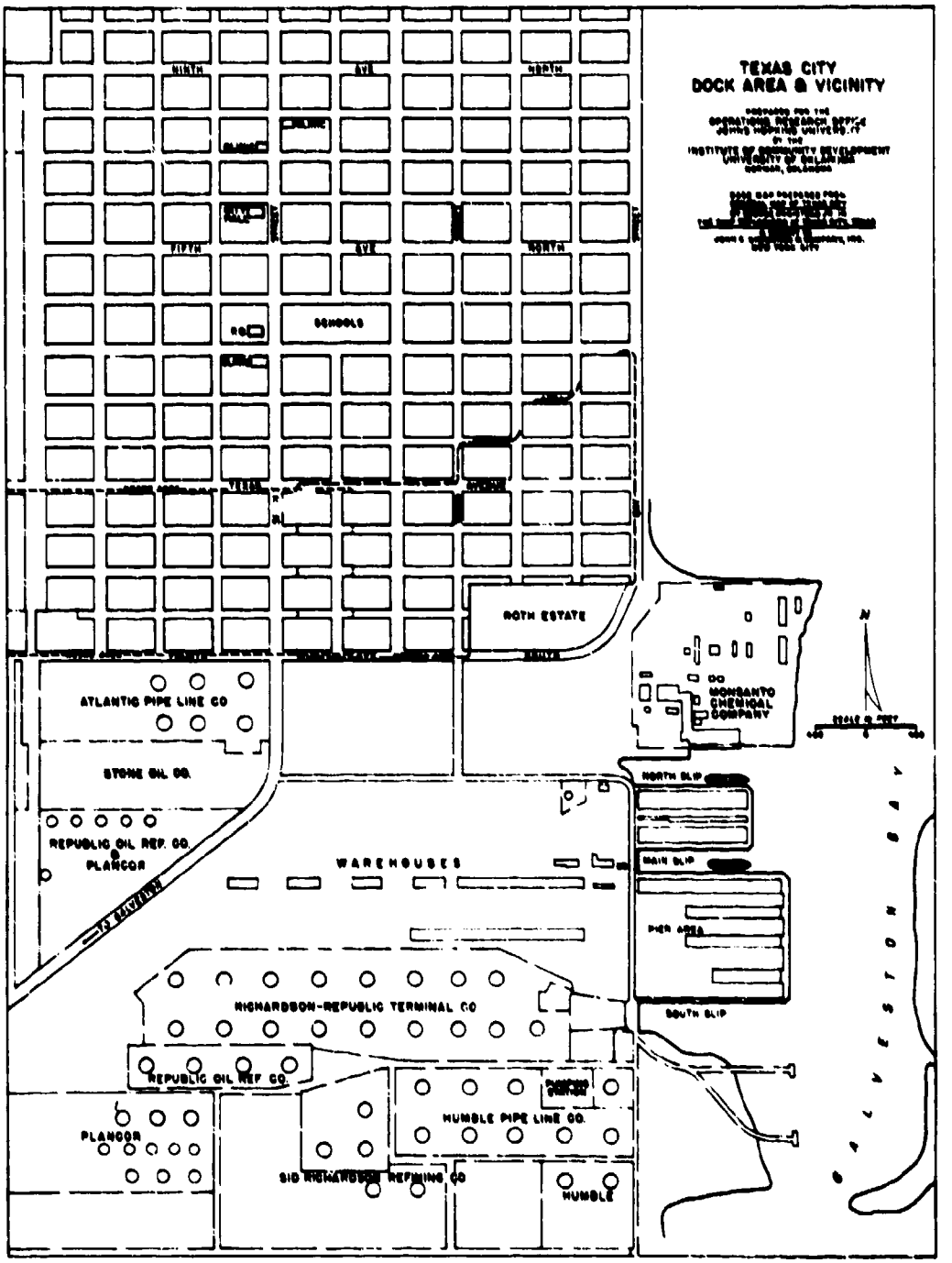

Fig. 1—Texas City: Explosion Port

As a background for the analysis of the more elusive sociological and psychological aspects, the nature of the explosions and their effects on materiel and human beings may be summarized.2/

PHYSICAL EFFECTS OF THE EXPLOSIONS

It is known that it was ammonium nitrate, used both as a fertilizer and as a constituent of explosives, that blew up at Texas City. Exactly how much exploded, with what energy, and by what mechanism has never been ascertained. Only the circumstances and the effects are known.

The S. S. "Grandcamp," a 10,419 DWT liberty ship, had aboard, when it exploded, 2,300 tons of ammonium nitrate in 100-lb paper bags, machinery, cotton, shelled peanuts, balls of sisal twine, and 16 cases of small-arms ammunition. When stevedores went aboard to resume loading at 0800, they discovered smoke drifting up from No. 4 hatch, containing about 880 tons of ammonium nitrate. For the next hour attempts were made to extinguish the fire by various means, including the use of small quantities of water and, later, smothering steam. About 0830 stevedores and crew abandoned ship, and the Texas City fire department fought the fire from the docks.

At 0912 the ship blew up, apparently from the detonation of the ammonium nitrate in No. 4 hold. On the basis of eye-witness estimates as to the relative force of this explosion and the later explosion of the "Highflyer," loaded with only 961 tons of ammonium nitrate, Armistead thinks it likely that only the fertilizer in No. 4 hold, and not the entire 2,300 tons was detonated. Only speculation is possible, however, for the "Grandcamp" and everything on it disintegrated at the moment of the blast.

Despite the existence of rumors describing "a series of explosions, like a chain reaction," the Armistead report makes it clear that there was only one disastrous blast at this time. A 25,000-barrel spheroid tank in a nearby refinery, containing a combustible hydrocarbon-air mixture, was ignited by a red-hot missile, and exploded with a loud report. While this may account

2/ Description of the effects on materiel is based on The Ship Explosions at Texas City, Texas on April 16 and 17, 1947 And Their Results (Washington: George Armistead, Jr., Chemical Engineer, 1947). Lithographed.

for the theory that there was a second explosion, the rupture of this tank did no damage, even to nearby tanks. The Monsanto Chemical Plant, adjacent to the North Slip, suffered no explosions and no other oil tanks exploded, although many were caved in by concussion or set afire by missiles. The "chain reaction" which the explosion of the "Grandcamp" started was psychological, not physical.

MATERIEL DAMAGE 3/

The physical effects were tremendous, however. Hal Boyle, a famous war correspondent, said that Texas City looked like Nagasaki after the atomic bomb had hit it. Actually, the feature that this blast had most in common with an atomic blast was the terrific concussion. Heavy concussive shock waves were set up, strong enough to break windows in Galveston, some 12 miles away. Evidently there was also terrific ground shock from this surface explosion, for water mains were ruptured in the city and the shock was recorded on a seismograph at Denver, Colorado. 4/ Since the exploding ship was in the water, a wave reaching a height of ten feet was thrown over the dock area. Another significant consequence of the explosion, one not to be expected in atomic bomb blasts, was the showering of fragments of ship and cargo as far as 10,000 feet. On the other hand, there was no significant thermal effect and all fires originated from secondary causes, such as red-hot fragments of metal. And there was, of course, no radiation effect.

Armistead found that destruction of buildings was virtually total within a 1,400-foot radius of a center point midway between the sites of the "Grandcamp" and subsequent "Highflyer" explosions. Even reinforced concrete structures were destroyed by the combined effects of the two blasts. Within a 500-foot radius, missiles were found in almost every square foot, including many pieces of metal weighing from one to five tons. Even at 1,500 feet, missiles were scattered about no further than five feet apart, and they averaged 20 pounds, with occasional one-and two-ton fragments. Within this zone of destruction were the Monsanto Chemical Plant and the offices and shops of the Texas City Terminal

3/ See Fig. 2.

4/ Elizabeth Lee Wheaton, Texas City Remembers (San Antonio, Texas: The Naylor Company, 1948), p 5.

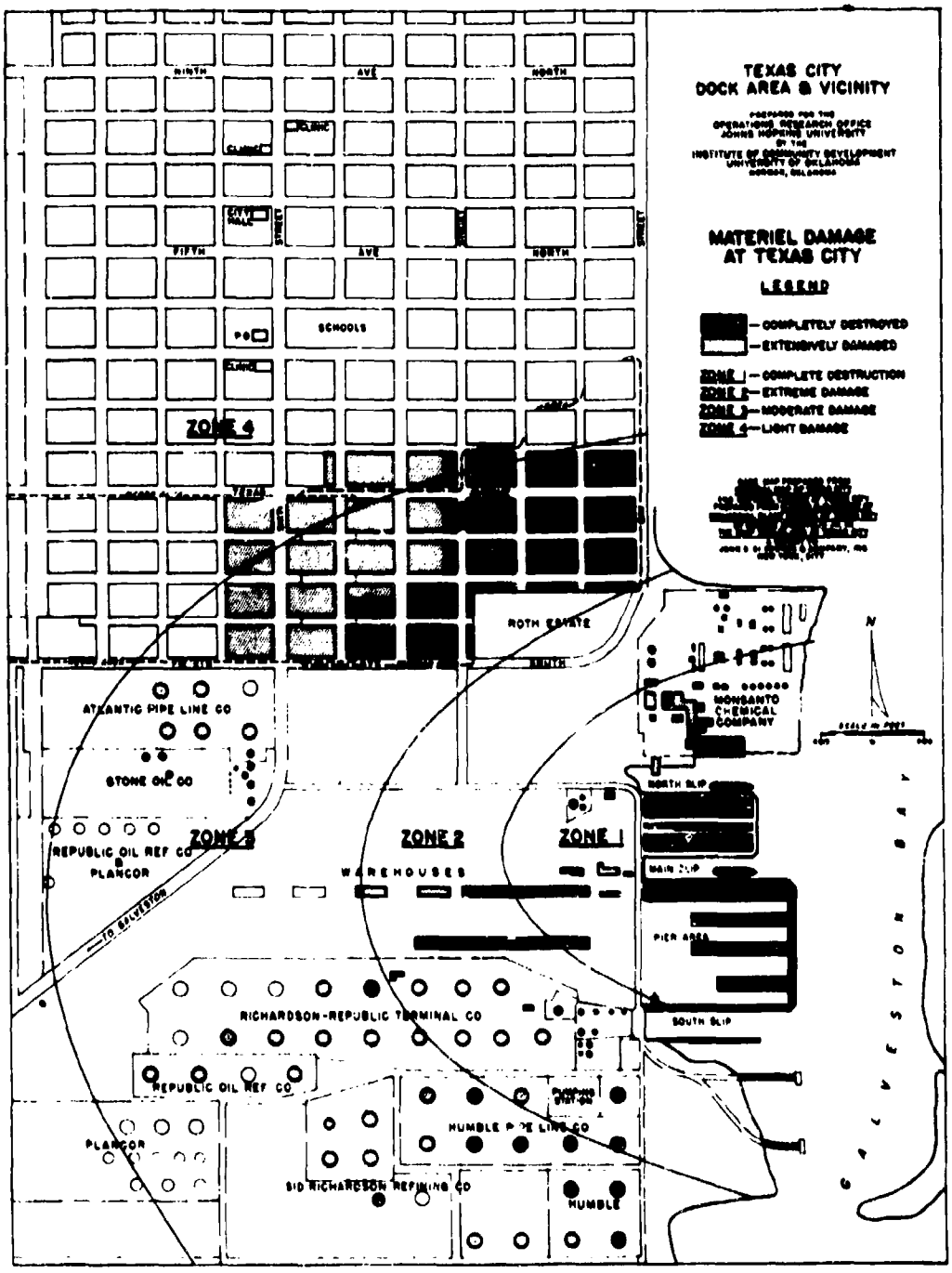

Fig. 2—Texas City: Explosion Port

Company, as well as many warehouses. Fires burst out immediately throughout this area.

Between 1,400 and 2,800 feet from the center there were few buildings, but these were destroyed or suffered extensive damage, from both concussion and missiles. Between 2,800 feet and 5,000 feet away, most of the damage to industrial structures was moderate, but the houses in a low-cost residential zone within 4,400 feet of the blasts were destroyed by concussion and missiles.

The area beyond 5,000 feet, including the business district and most of the residential section of Texas City, was generally one of slight damage, with some notable exceptions. The effects of concussion were to shatter window glass, loosen plaster, and crack some walls. Some complete destruction and extensive damage were caused even at this distance by missiles which crashed into buildings. In the schools, approximately a mile from the center, windows were shattered, plaster knocked down, and some exits were blocked by jammed doors and fallen masonry. No fires were started outside of the industrial area. But there were oil fires in a refinery over 4,000 feet from the center and in close proximity to the Negro residential area.

While the explosion of the "Highflyer" is believed to have been equal in intensity to the first blast, its principal effect was to complete the destruction begun by the "Grandcamp." It caused only one death and less than ten major injuries. From the standpoint of social disorganization, it was mainly of psychological significance.

MEDICAL EFFECTS[5/]

The greatest amount of injury to personnel occurred within a 1,000-foot radius of the center point, and was caused almost entirely by the explosion of the "Grandcamp." Almost all of the dead and the seriously injured were within this zone, yet there were some escapes which are as yet unexplainable. There were nine survivors who were standing within 100 feet of the "Grandcamp," one only 30 feet away. Within 500 feet there were 112

5/ Virginia Blocker, M.D., and T. G. Blocker, M.D. "The Texas City Disaster: A Survey of 3,000 Casualties," The American Journal of Surgery (LXXVIII, No. 5, Nov., 1949) pp 756-771. See Fig. 3.

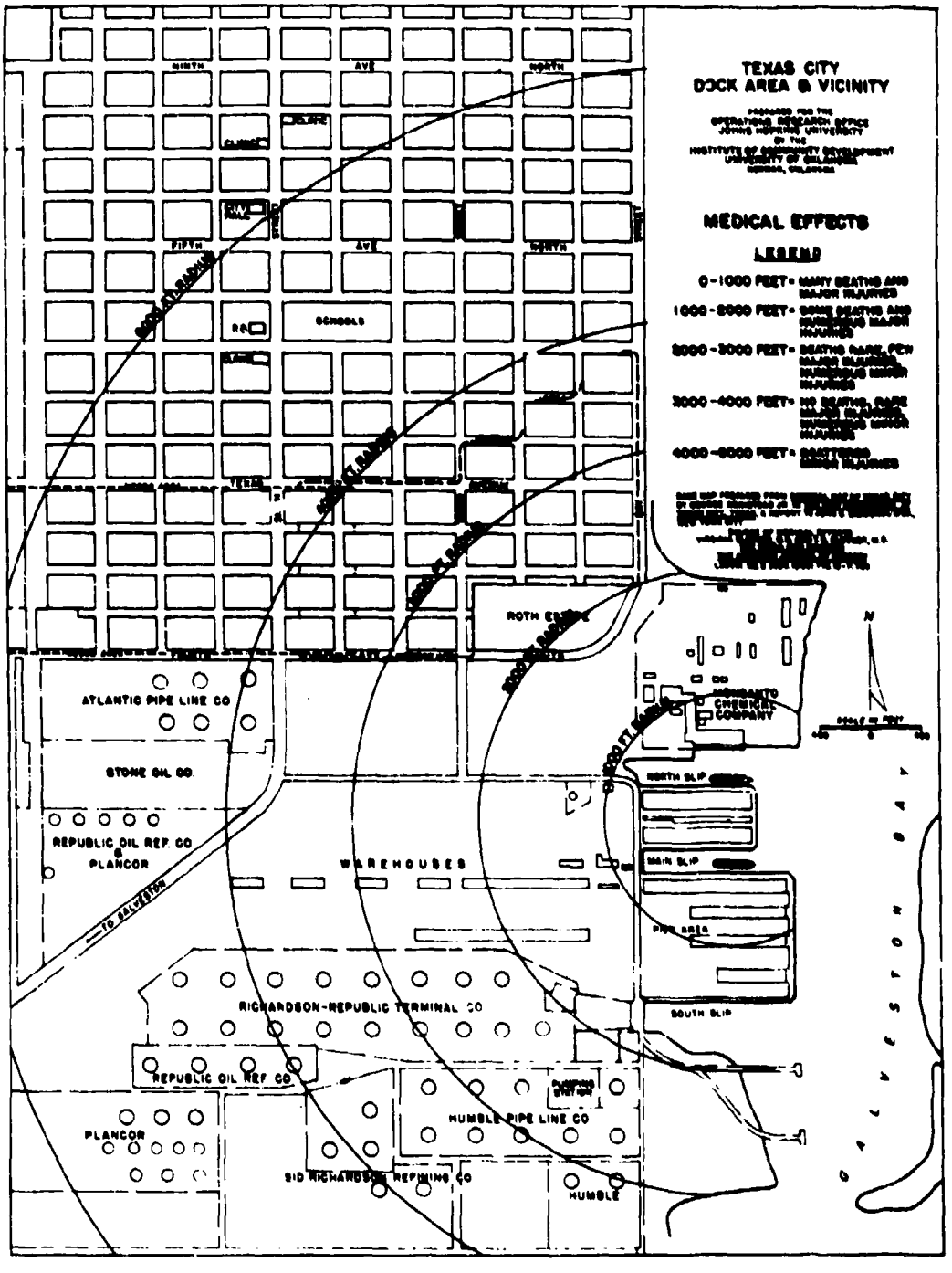

Fig. 3—Texas City: Explosion Port

survivors, and between 500 and 1,000 feet, 418. Exactly how many people were in this zone at the time of the explosion will never be known.

The deaths in this zone were caused by the direct effects of blast, by flying debris, by collapsing buildings, by fire, and by drowning. In most cases, death came as a result of a combination of these causes. Most of the persons within this 1,000-foot zone suffered perforations of one or both eardrums.

The zone from 1,000 to 2,000 feet contained relatively few people at the time of the first blast. Most of the seriously injured in this zone were inside buildings which collapsed, but some standing in the open were injured by flying debris. There were few deaths, but most of the survivors showed evidences of direct blast injury. Had this zone been more heavily populated, there are strong indications that at least part of it might have been included in the first "medical" zone.

The third and fourth "medical zones," between 2,000 and 3,000 feet and 3,000 and 4,000 feet, respectively, were heavily populated, containing residences and schools. Deaths were rare in the third zone and there were none in the fourth. Blast injuries in these zones were of a minor nature. The typical injuries were lacerations, contusions, and abrasions caused by shattered windows and falling masonry. The area beyond 4,000 feet was not surveyed in the Blocker study, but it is known that there were scattered injuries from missiles and flying glass as far as 5,000 to 6,000 feet from the center point of the explosions.

It is not clear just what the neurological effects of the first explosion were. The majority of patients admitted to John Sealy Hospital, in Galveston, were in a state of mild shock. In summary of the psychological consequences of the blast, the Blockers say:

> Among hospitalized patients at John Sealy only two or three acute psychotic disturbances arose which were thought to be precipitated by the disaster. A number of patients returned to the Out-Patient Department complaining of "concussion" headaches and dizziness... The majority cleared spontaneously within a few months' time. There were remarkably few patients who appeared with the so-called compensation neuroses. Most patients who

attributed psychoneurotic complaints to the explosion were found to have been poorly adjusted individuals prior to the disaster.6/

The foregoing paragraphs present a picture, in broad strokes, of the condition of property and the people most affected shortly after the explosion of the "Grandcamp." The more detailed picture of the socio-psychological situation must be preceded by analysis of the community as it was before the blast.

TEXAS CITY BEFORE THE EXPLOSIONS

In 1947 Texas City could appropriately be described as "young and thriving." Between the time of its inception in 1893, as a port, and 1940, it acquired a population of only about 6,000 people. But between 1940 and 1945 its population trebled, reaching approximately 18,000. This burgeoning was the result of the fact that the city suddenly changed from a small port to an important industrial center. During this period the Carbide and Carbon and the Monsanto chemical companies built plants there; the largest tin smelter in the world was located there; the Republic Oil Company built a refinery near the Pan-Am refinery which had been there since 1933; and a "seatrain" terminal was added to the port facilities. Hence, by the time of the disaster of 1947, Texas City had become an important Gulf port and the center of a thriving industrial district. According to the American Red Cross, "it has been estimated that 55 percent of the wage earners in Texas City did not live in the city, but in other cities and villages within a radius of 50 miles from their place of employment."7/ It was and still is an industrial community, rural in no sense of the word. Texas City is, moreover, only 10 miles from the city of Galveston, enjoying its facilities and drawing many workers from it.

The recent growth of the community and the types of employment it offered also gave Texas City a high proportion of young adults. The requirements of highly technical industries attracted professional and skilled workers, so it has a large class of educated workers, including many college graduates.

6/ Ibid., p 770.
7/ The American National Red Cross, Texas City Explosion (Nov. 1948), p 19.

Texas City is also ethnically heterogeneous. In the first place, its new industries draw employees from many parts of the United States. There is a large Negro element in the population, living in a segregated area adjacent to the oil refineries and tank farms, about three-quarters of a mile from the waterfront. Traditional southern patterns of racial etiquette are still observed throughout the community.

Only half a mile north of the dock area is a small area of low-grade housing occupied almost exclusively by Mexicans. (See Fig. 1.) While these Latin-Americans are concentrated residentially, there is no formal segregation in schools, churches, or business and industry. But the Mexicans and the Negroes comprise the low-income, unskilled element of the labor force, and are the city's slum-dwellers.

Disaster was not new to Texas City. In its early days the town received some of the force of the hurricane which struck Galveston in 1915. Again, in 1943, the city suffered damage from a small hurricane. Because of the annual threat of tropical storms, the Galveston County Chapter of the American Red Cross had developed a disaster plan for both Galveston and Texas City. Just 27 days before the explosions a disaster preparedness and relief institute had been held in Texas City.

Apparently, however, the people of Texas City had given little thought to industrial disasters, nor had they taken their organization for natural disasters very seriously. The chairman of the disaster organization said, after the explosions:

> We had an organization, but it was designed for hurricanes. We weren't prepared for anything like this. In a hurricane, you have some warning and can get your organization ready. But we had no warning in this, and our organization was scattered all over town. And do you know what happened at our meeting to develop a disaster organization just three weeks before the explosions? People pooh-poohed the idea!

If anything, the people of Texas City were contemptuous of threats of industrial disaster. There had never been a major explosion or fire in the area, but minor ones were common in the

refineries and on the waterfront. In the words of a long-time resident of the city:

> Hundreds of ships have been afire, or have had fires in their cargoes, at Texas City wharves. Bulk sulphur cargoes often ignite. Oil and gasoline tankers and many other ships have suffered fires. Mostly, the fires were inconsequential. A few were serious and costly. Always before, the fires have been fought and brought under control. With a fire to fight, no ship's master has ever been ordered to take his vessel from a Texas City wharf, out of reach of firemen and help from shore. But assuredly, had the firefighters or the port officials expected any such disaster, there were brave fools among them who would have cast off her lines and sailed her out of the harbor.[8]

People in Texas City were not conditioned to explosions; but they were conditioned to disregard very real threats to life and property.

THE PERIOD OF IMPACT

In the light of statements made after the disaster and the existence of this disregard of danger, it may be stated that there was no period of threat, psychologically, in Texas City before the first explosion. An objective threat existed from the time the cargo of the "Grandcamp" caught fire, but this threat had no subjective reality even for the people closest to the burning ship. A few people who did give momentary thought to the possibility of an explosion ascribed the danger to the wrong source, and they did not take their own fears seriously. They were somewhat concerned about the small-arms ammunition in the cargo, but the far more dangerous component was labeled "Fertilizer, Ammonium Nitrate." Not even after the disaster did people in Texas City claim that they had anticipated an explosion. Rather, the typical reaction was, "it was just luck that kept me from being down on the docks watching the fire!" The predominant reaction before the explosion was curiosity.

8/ Elizabeth Lee Wheaton, Texas City Remembers (San Antonio, Texas: The Naylor Company, 1948), p vii.

As a result, the dock area was unusually crowded. Perhaps as many as 200 longshoremen, authorized to be in the area to work the "Grandcamp" and other ships, had gathered to watch the fire. Twenty-seven city firemen, the plant fire department from The Republic Company, and several Republic executives were on the docks. In addition, there must have been nearly 500 casual onlookers in the vicinity of the North Slip, where the "Grandcamp" lay. As a matter of routine precaution, the chief of police had established two road blocks on the avenues of approach to the area, but many people walked around these vehicular barriers. Those who did so, placed themselves within the deadly 1,000-foot zone surrounding the ship. Several hundred more spectators, less curious or less venturesome, gathered on a roadway beyond the roadblocks but still only about 2,000 feet from the ship. Still further away, in the town proper and even in outlying plants, people knew of the fire and occasionally paused in their work to watch the "beautiful orange smoke" which could be seen for miles. But no one expected an explosion; they had watched too many ship fires before with impunity.

Just as the explosion of the "Grandcamp" had different physical effects, varying with the distance from the center of the blast, there also were different psychological and social reactions. Hence the immediate social effects, during the first ten minutes or so after 0912, may best be analyzed by zones. (See Fig. 4.)

ZONE I: CENTER TO 1,500 FEET

The effects of the explosion on buildings and human organisms within a radius of 1,500 feet from the blast center have been described. Destruction of buildings was almost complete, and the majority of the people in this zone were either killed or seriously injured. In addition, the entire area was covered with a pall of thick, black smoke, and both the living and the dead were blackened by a mixture of oil, water, and mud. Many survivors had their clothes blown completely off by the blast.

As has been indicated, there was no flight from the area adjacent to the ship, even seconds before the blast. The people in Zone I were caught unawares in the midst of whatever they happened to be doing at the time. Most of them were unconscious

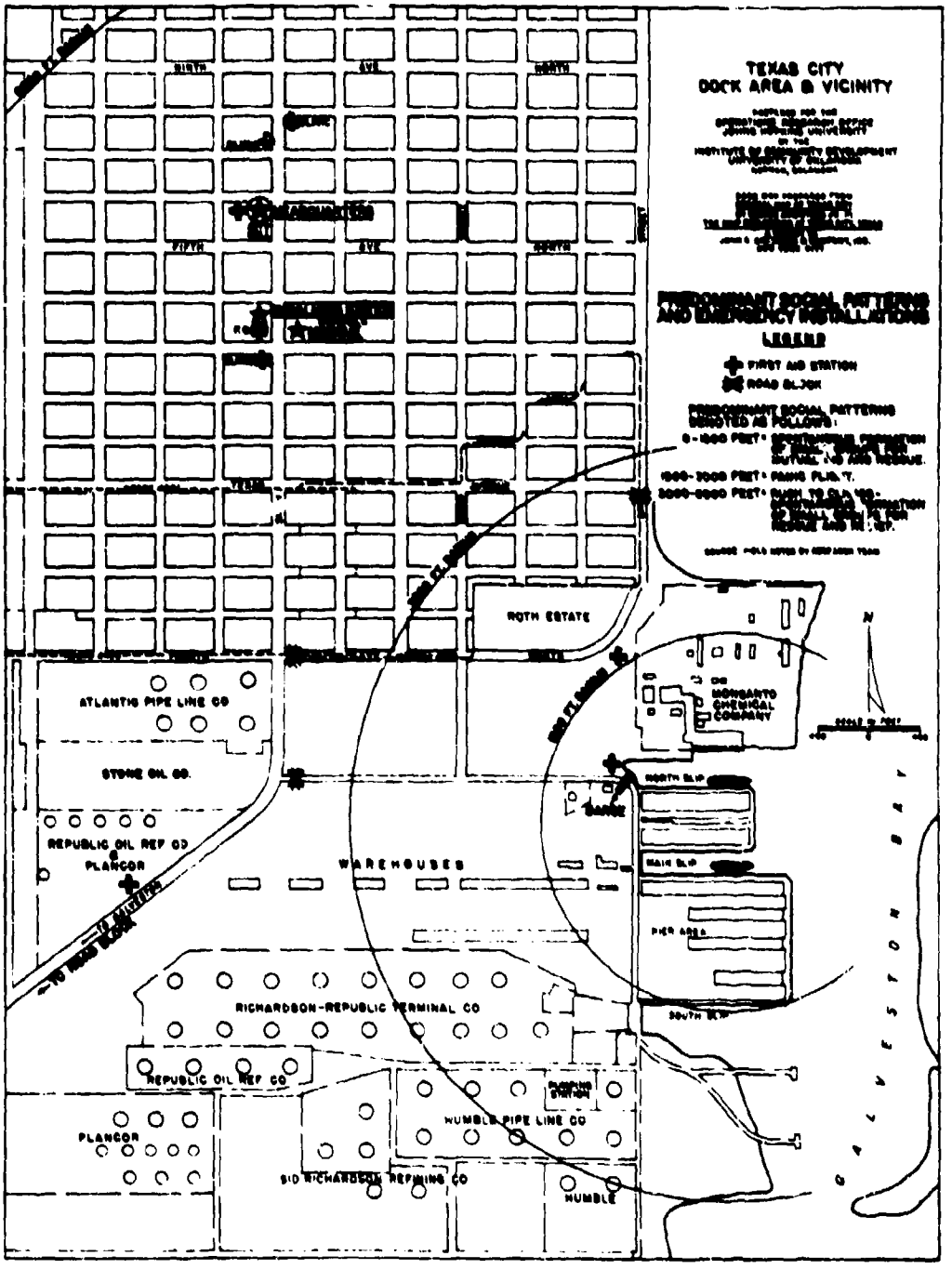

Fig. 4—Texas City: Explosion Port

or deaf before they could even hear the explosion. The Blockers describe the typical impressions of persons within this zone:

> An engineer walking away from the docks . . .was immediately aware of "a soft powerful force" against his body a fraction of a second before he was knocked down and surrounded by a thick black vapor . . . Others spoke of a "rush of wind." . . .Among the group of patients who were unconscious for varying periods of time, it was noted that the majority recalled feeling the air blast before blacking out even though they sustained moderately severe head injury from flying debris or "blast concussion."[9]

This initial air blast was not the only force that wreaked havoc among these people. Unless the theory of a second blast is accepted, it seems probable that a suction phase followed the initial pressure phase, for some victims told of being "blown back towards the docks" or of having debris blown off of them. The "tidal wave" created by the blast added to the horror and confusion, sweeping many injured persons to their death in Galveston Bay or drowning them where they lay.

The remarkable thing about those survivors who remained conscious is not the fact that they were less aware of pain than of being "stunned" or "dazed." It is that, with unbelievable calmness and efficiency, so many of them set about the task of extricating not only themselves but others. Some were motivated by the thought of family, crying, "Oh, God! Save me for them! Please!"[10] Apparently, however, the sheer will to live was sufficient motivation. In many cases, they did not know what had happened. The people in the Monsanto buildings tended to think that there had been an explosion within the plant. Few, if any, people in this zone were aware of the damage that had been done in the residential area, and were therefore relieved of concern about their families. But they felt that they must get out of the inferno. No hysterical crying or screaming was reported; the screams that were heard were those of the trapped, pleading for aid. On the other hand, reactions such as the following were prevalent:[10]

> I was unconscious for a few minutes. When I came to, I found I was blinded. Groping my way, I started toward

[9] Ibid., p 761.

[10] Interviews quoted in Texas City Remembers, pp 11-13.

a man who was moaning; someone else came up and led me out...

Dragging an injured leg, I hobbled toward the opening by the elevator. The stairs were gone. The building behind me was burning...

I got back on my feet and saw I couldn't walk...I knew I was in a dangerous place; so I started crawling.

Contrasted with this determination to preserve life at all costs was a sudden and complete disregard for property. Men in positions of great responsibility in this area made the following statements to the investigators:

My first thought was for the personnel of the company. It wasn't until I thought all of those alive had been removed that I thought of the company's property. That was several hours later.

Hell, I didn't give a damn about my job. I didn't think about anything connected with it.

Property? Nobody gave a damn for property! All that was important was life. I've often wondered just how it would be to walk off and let a plant burn up. That was just the way it was. We didn't even consider fighting the fire.

This overwhelming concern for life was in only a few instances purely selfish. Even in the face of the direst threat to their own personal survival, the people in this zone remained basically social creatures, concerned for and dependent upon the survival of their fellows. Men with bloody heads, lacerated bodies, broken arms and legs, still thought of saving others as soon as they realized that they themselves were still alive. As one man said, "After finding out that I was not badly hurt [he nearly lost the sight of one eye] I thought of the employees and began searching through the building for the office force."

The rescue work that was done by the survivors in Zone I for each other did not consist merely of individual acts of heroism and altruism. It consisted of cooperation and organized group activity which started almost immediately. This organization was new and spontaneous; it was extremely informal; and it was on a small scale. But organization it was, for new group structures emerged here and there in the stricken area. The nature of this

type of social organization is revealed in the account of a Monsanto worker:

> I was blown up in the air and fell on top of Bud. He was lying under a piece of steel; I was on top of it, but my leg was bent underneath it. We both screamed, but we weren't hysterical. Then we couldn't hear anything. I finally got my foot loose, but my leg was broken. I kept trying to get Bud loose. Finally he shook all over and then blacked out. I thought he was dead so I left him.
>
> Just as I got outside the building, Foster fell right in front of me. I was crawling. I said, "Come on, Foster, let's get out of here." He said, "I can't walk, I'm dying!" I said, "Come on, you can crawl." Then Johnny and Clyde came along. I said, "Johnny, help us -- we can't walk." His arms were broken and he said, "I can't help you, but I'll stay with you. If you can crawl, I'll guide you." Talk about cheer -- that helped me more than anything, just when he said, "I'll stay with you." Johnny guided us out. Clyde was blinded, but he held on to Johnny's arm. Foster and I crawled behind them. We didn't pay any attention to anybody that didn't look like he was alive. I just thought, "He's dead."

Although these men had been workers in the same plant before the explosion, they had not comprised any sort of self-contained social unit, nor did one rank higher than the others in authority. The basis of their newly formed group was common need and simple physical proximity. On this basis alone, they formed a team for mutual aid. Immediately a group structure arose, dictated by the requirements of the situation. Johnny became the leader, without challenge, because he alone had both eyes and legs that would function to meet the requirements of the situation. Even a new group norm, appropriate to the new situation, arose; in their striving to escape, the group showed a disregard for the remains of dead comrades which, in ordinary circumstances, would be regarded as inhuman.

Throughout Zone I, little groups of this type arose and began to function. A few individuals who immediately rushed into the area from a safer distance fitted into a similar pattern. At this stage, no one attempted to "take charge" arbitrarily, on the basis of rank previous to the disaster, or of the fact that he had not

"been in it" and was therefore better fitted for clear thinking and leadership. As it was frequently put, "everybody was equal." In the confusion and wreckage only two things gave a man pre-eminence: capacity to extricate the injured, by either brute strength or skill in the use of tools; and sufficient knowledge of the area to know where to look for survivors. No widespread organization or over-all leadership developed; the situation was too confused. But there was organization, and effective organization, of a small-scale, informal nature, throughout Zone I. While many of the participants, both from within and from without this zone, were motivated by the desire to find relatives or friends, they nevertheless helped anyone who was alive.

ZONE II: 1,500 TO 3,000 FEET

The people in Zone II were not "in" the explosion in the sense that those in Zone I were. Instead, they saw and heard the disintegration of the ship; they felt the shock of the air blast; and they saw the shower of missiles descending all around them. Moreover, they saw the Monsanto plant and the ruins of the warehouses in the dock area burst into flames.

Those in this zone at the time of the explosion included several hundred spectators gathered beyond the roadblocks, as well as the residents of the Mexican residential section. A minority of this group, mostly people with relatives or friends in Zone I, rushed into the devastated area around the docks to seek them and to help where they could. No leadership and no orders were necessary. When the situation itself did not dictate a course of action, only a suggestion was needed to make these people part of one of the small teams functioning in Zone I.

But the majority of the people in this second zone, so oblivious to the genuine threat that had existed for an hour before the blast, suddenly became danger-conscious. They had heard the blast, they saw the fires; now they dreaded more explosions. Hence the predominant reaction in Zone II was panic flight. A man who had driven into the Monsanto area just in time to be caught in the explosion, noticed the crowd of sight-seers on the road as he drove in. The first thing he did after the blast was to walk back to this road seeking help. In his own words, "All the spectators that had been there when I drove in were gone. That has always amazed me."

Not only had the spectators fled, but most of the inhabitants of the residential districts in Zone II deserted the town. Their flimsy houses were devastated by the shock wave and flying debris. A few with relatives in Zone I rushed there to seek them, but the majority fled precipitously, not stopping until they were several miles out of town. The aid that this zone, the closest one to the central zone of destruction and death, gave to the survivors in the dock area was the work of only a few isolated individuals who rushed in and did what they could.

ZONE III: 3,000 TO 8,000 FEET

Zone III included a large part of the white residential area, the Negro district, the main business district, the schools, the city hall, the fire station, and the town's three small, private clinics. It also included some refineries. (See Fig. 4.) The people here knew even less of what had happened than did the people in Zone II. Those who happened to be looking towards the docks saw a great cloud of black smoke mushroom high into the air, and a rain of missiles that actually knocked an airplane out of the sky.

Those who did not see the cloud heard one, two, or even three tremendous blasts. Even inside buildings they were buffeted about, and shattered glass was driven inward with terrific force. Plaster fell in many buildings; missiles crashed through the roofs of a few. But people in this zone still did not know just what had happened. At first they were stunned, or dazed, momentarily. Then most of those who were inside buildings at the time thought of some localized cause, such as the explosion of a gas furnace, not realizing the full extent of the damage. As they rushed outside and saw the smoke in the direction of the docks, many decided that it was the Monsanto plant that had blown up.

Almost universally in this zone the next thought was of relatives. Storekeepers rushed from their shops to go home to their families, leaving goods and cash unguarded. Parents started for the schools to see about their children. Many people with relatives in Zone I moved in that direction.

There was some panic, but it was different from that in Zone II. It was manifest chiefly in the frantic rush of people with

minor injuries towards the clinics, which they overran before the more serious casualties from Zone I began to arrive. The only part of this zone in which headlong flight from Texas City was the predominant reaction, was the Negro residential district.

While one may speculate as to the part that lack of education may have played in causing this reaction, it must also be noted that physically the Negro district resembled Zone II more than it did other parts of Zone III. It was the closest part of Zone III to the disaster. It was also immediately adjacent to oil refineries and tank farms in which some fires had been started by missiles. The buildings were of flimsy frame construction, like those in the Latin-American quarter, and damage was extensive. Even in this area, however, some Negroes who had relatives in Zone I moved in for rescue work. It seems likely that the flight from town of the majority of Negro residents was due primarily to the fact that the threat of further disaster seemed greater in that part of Zone III than in other parts.

The children in the schools suffered only minor injuries, and there were no deaths. But indirectly the school children were the cause of much confusion in Texas City. From the evidence available it appears that the evacuation of the damaged school buildings was orderly and without panic.11/ Once outside the buildings, however, both teachers and pupils were confronted with an ambiguous situation. Many of the children were bleeding; all wanted their parents. Should the teachers hold them in the schoolyards in hopes that parents would come for them, or should they allow them to disperse in search of medical aid and their parents? Some of the children did wait, but many broke away or were released from the teachers' control and ran frantically through the streets, towards home or towards the clinics. This behavior was generally described as the greatest source of confusion in the business district and at the clinics. To it was added the confusion caused by frantic parents rushing about town searching for their children.

It was in Zone III that the established leadership, the city officials, of Texas City was centered. Here also, on the main business street, was the office of the man who headed the local

11/P. W. Kearney, "Lessons from a Dotted Line of Blood," Readers Digest, LI (December, 1947) pp 57-58.

Red Cross disaster organization. These were the men to whom the people of the community might be expected to turn when their town was disorganized. But these leaders were taken by surprise just as much as were the people whom they were to lead.

The chief of police was in his office in the City Hall, on the main business street. He tells what he did at the time of the explosion:

> When the thing blew up, it knocked me down. For some reason -- I never have figured out why -- the dispatcher and I both ran into the toilet. I guess we stayed there less than a minute and then came out into the office again. I guess my first thought was, "What to do now?" All the communications were out. I ran over to the telephone exchange and got a line to the Houston police. I told the captain I talked to, "We've had a ship blow up down here. Send me all the uniformed police you can. Call every other department that can get uniformed police down here, and send all the ambulances you can get."

Subsequent events proved that this single action of calling outside the disaster city, describing the situation, and telling what was needed was very effective. The Houston officer, with unimpaired communication facilities available, immediately took over the task of recruiting police and medical aid from every available source.

Having made this important call, the Texas City officer was able to do little else. Not even his small force of 19 officers were all available. But he returned to the City Hall and began dispatching the few who were there, some to set up r[illegible]ocks, others to go to the dock area and do whatever they could. All were told, "You'll just have to use anybody you can get to help you." This they did, and many civilians responded readily to their requests. Some auxiliary policemen, from the wartime emergency force, also reported to volunteer their services.

Even the mayor could do little more. He was driving along the main street at the time of the explosion. He stopped to quiet some frightened women, drove some children to their homes, and then went to his office, to attempt to bring some order out of the chaos.

The Red Cross chairman resisted the impulse to go home and see about his family and, like the police chief, ran to the telephone exchange to appeal for outside help. When he realized the extent of the disaster and saw the disorganization in the town, he realized that his newly formed disaster organization would be inadequate to meet the problem -- "our organization was scattered all over town."

With intra-city communications disrupted and the rank and file of the city forces scattered, there was little that the established leaders could do except appeal for outside help and then attempt to organize and use whatever personnel was immediately available.

But there was another type of leader who quickly began to function, namely, the emergent leader, the private citizen who saw something that needed to be done and did it, drawing others to his assistance by example more than by order. A story of this type of leadership and cooperation was told by a merchant:

> I was blown from the sidewalk clean inside a cafe, but there wasn't a scratch on me. I went outside and it was an awful sight. There were people running all over the street, cut up, some screaming. About that time one of the firemen -- one who wasn't killed -- came by me and said, "For God's sake, where can we get some first aid supplies? These school kids are coming up here needing first aid!" He and I ran across the street to that drug store. It was a wreck, the front all blown in. I said to the owner, "Where can we get some medical supplies?" He said, "There they are on the floor -- take what you want!" We picked up all we could carry and ran down to a vacant lot and set up an aid station.

Other aid stations were soon set up in this manner. Some of the auxiliary policemen began to direct traffic. Other men turned their cars in the direction of the blast area to help in rescue work. Just as in Zone I, however, there was no general organization, coordination, or leadership. The measures that were taken to alleviate the situation were taken by small, spontaneously formed, uncoordinated groups.

Of particular significance for the objectives of this study are the events at the Republic Oil Refinery just after the explosion.

Assembled there, at about 4,000 feet from the blast center, was the largest group of organized men in Zone III. While they were beyond the zones of extensive damage and serious injury, the nature of the plant offered great potentialities for danger. In the first place, a power failure from any cause constituted an emergency in the refinery. Some of the installations were potentially explosive, particularly the mammoth "cat-cracker." There were also highly explosive and inflammable stores of petroleum in the plant area. Actually, no secondary explosions were set off and no fires were started in the refinery, but several large missiles crashed into the area.

The first reaction of most of the men in the plant was the thought that something in the area, probably the cat-cracker, had blown up. There were a few instances of wild flight among men working in the machine shops. But the basic organization of the refinery remained functional, even though the top executives of the company were away in Zone I. The crews operating stills and other installations stayed at their posts, following the prescribed procedure in case of a power failure, that is, shutting down their units. Only after this had been done did they scatter from the plant area, some to return to their homes, others to take part in rescue work.

ZONE IV: 8,000 FEET TO SURROUNDING TOWNS

Zone IV included the remainder of the residential area, outlying industries which were part of the Texas City industrial area, the various small towns from which Texas City drew many of its workers, and the city of Galveston, a little over ten miles across the bay. The people in this zone were out of physical danger, although a few missiles fell as far out as 10,000 feet, and the blast concussion was felt in Galveston. These people did not, of course, know exactly what had happened. Many in Galveston thought there was an earthquake until they saw the smoke rising from Texas City. In the outlying plants around Texas City, men thought first of local causes, explosions within their plants. When they realized the blast had been on the waterfront, or near it, many thought it was Monsanto or the cat-cracker at Republic that had blown up. One thing they did know, even better than some of the people closer to the center: the explosion was tremendous, and had affected a large area.

People were by no means calm and unconcerned in this area. Predominantly, they were concerned as to the fate of relatives, friends, and any human beings who were closer to the center than they. Despite these personal concerns, however, the organization existing in Zone IV did not break down. At one large plant, the workers stood by until they were told to shut down their units and leave to look after their families. Another plant did not even shut down, although men who wanted to were allowed to leave. In Galveston, schoolteachers in some schools took their classes into the schoolyards to wait until parents came for them. At other schools, classes continued.

From all parts of Zone IV, many people rushed towards the Texas City waterfront as individuals, not as members of organized groups. But this zone was different from others in that some deliberate organization and planning for assistance began within fifteen minutes after the explosion. One instance, in an outlying plant, was described by a plant executive:

> I rushed out of my office to see what had happened, and could see pieces of metal still flying through the air. I met our safety director outside. We decided it was more serious than an ordinary fire and decided to send aid. We formed a team of the safety director, myself, the plant doctor and the nurse. We took two trucks, gas masks, fire-fighting equipment and some first aid supplies. We drove directly to Texas City. We saw injured people on the streets and wondered if we should stop and help them, but decided to go on to the blast area. We went to the very edge and set up a first aid station.

In Galveston, a doctor witnessed the explosion from his office window and immediately alerted all the hospitals in the city to prepare to handle a large number of casualties. The people at the county Red Cross headquarters began at once to function, dispatching ambulances and workers to Texas City. A volunteer Red Cross worker's story gives some insight into the speed and efficiency of their operation:

> I was principal of a high school at the time. A friend of mine called me less than ten minutes after the explosion and told me what had happened. Immediately I called the Red Cross and told them I was available. They had

already been notified and told me that they could use 50 boys for stretcher bearers. In about ten minutes I had pulled out 50 husky boys and started them towards the hospital to get on the ambulances. Then I started for Texas City myself.

There was also some spontaneous, unorganized activity of a significant nature in Galveston. A four-lane highway ran through the center of the city and out across a causeway towards Texas City, and within minutes after the explosion this highway became a speedway. Alert civilian volunteers immediately took up the task of blocking sidestreets, thus preventing what might have been a disastrous traffic snarl.

Two Salvation Army workers stationed in Galveston also departed immediately for Texas City. Finally, a few Texas State Patrolmen, cruising in neighboring counties, picked up reports of the disaster on their radios and sped towards the stricken city.

SUMMARY: PERIOD OF IMPACT

In summary, Texas City and the area for miles around was the scene of tremendous confusion and disorganization for the first few minutes after the explosion. Momentarily people were shocked into immobility; then they were stricken with horror, fright, or anxiety about loved ones. Frantic rushing about followed, both towards and away from the central zone. Except in the peripheral area, Zone IV, organizations and plans were useless and generally forgotten. The people of Texas City were faced with an utterly unexpected situation, and one with which they obviously could not cope themselves. But the significant thing about the Period of Impact is not that the confusion was so great or the people so bewildered and overwhelmed; it is the fact that during this period anything was done at all. Yet reorganization started almost immediately, though on a small scale, spontaneous and informal in type.

PERIOD OF IMMEDIATE REACTION

By the "Period of Immediate Reaction," reference is made to that time between the impact of the disaster, with the few minutes

of initial reaction, and the time when the great majority of the seriously injured victims are removed to aid stations or hospitals. This period is characterized by the urgency of the needs of the barely living, which overshadows concern with protection of property or recovery of the dead.

In Texas City, the Period of Immediate Reaction lasted until approximately 1400 of the day of the explosion. It was also at about this time that a community-wide organization, with designated leaders, actually began to function. During the Period of Immediate Reaction this organization was developing, but at the same time numerous problems were arising.

The thing which most sharply differentiated this period from the briefer Period of Impact was the fact that outside help began to arrive in Texas City. Hundreds of vehicles, including private passenger cars, ambulances, fire trucks, and heavy construction equipment, converged on the city along three crowded access roads. A new problem arose immediately -- the problem of traffic congestion and control.

TRAFFIC CONTROL

Surprisingly, none of the informants who came into Texas City from outside during this period reported that evacuees impeded incoming traffic. This may be ascribed to two things, the fact that there was not a mass flight from Texas City immediately after the blast and the fact that many of the people who did flee at this time were on foot. During the first few minutes vehicles moving towards Texas City were able to travel at high speed, but as every minute passed the volume of traffic converging on the city increased and the roads did become jammed. Within 45 minutes to an hour's time, incoming cars were met by ambulances and private vehicles evacuating the injured, and the traffic problem became acute. At least part of this congestion was unnecessary. Many of the cars approaching the city contained anxious relatives or even mere curiosity-seekers and they, of course, impeded the movement of doctors, ambulances, fire trucks, and wrecking equipment. Within Texas City itself there was an equally serious problem, for the small city was jammed with vehicles speeding in all directions. Many of the drivers did not know where to go to be useful, and the roads into the water-

front area were littered with debris. Thus both external and internal traffic controls were needed.

The problem was met first by spontaneous, uncoordinated action. A handful of local police officers, assisted by civilian volunteers, took over the task of directing traffic in the business and residential districts and established some roadblocks on the approaches to the town. Uniformed plant policemen from industrial establishments on the edges of the town and the waterfront area individually assumed the responsibility of directing traffic on nearby roads. As troopers from the state highway patrol arrived at Texas City, many of them took charge of these already existing control stations and began screening the sightseers from the potential rescue and relief workers. There was still, however, no over-all, coordinated plan of traffic control until after noon on Wednesday.

RESCUE OPERATIONS

During the Period of Immediate Reaction anyone who was willing to enter the blast area, ostensibly to assist in rescue operations, could do so. During most of this period there was no large-scale organization, but there was a great deal of small-scale teamwork. The man who later became coordinator of rescue operations describes the emergence of general organization during this period:

> At first there were just little groups doing separate jobs. Many of them were crews from different plants, that had come in. They were all working independently -- there is bound to be disorganization after a disaster this big. There was no problem of getting people to work. There were many standing around who seemed to want to help but did not know what to do. They were glad to follow any reasonable instructions. These separate crews started out working on their own, but they began to get together when they would come up against big jobs. Later on when one person was put in charge and they found out about it, they would come to him for instructions. They realized that they could get more done if they worked together.

The statements of some of the people who worked in these small groups indicate that the demands of the situation were so obvious and so urgent that authoritative leadership was hardly needed. The person who could provide the equipment or the know-how to get a job done became the nucleus of a team. Who he was did not matter. Many rescue workers did not know or could not remember after the disaster with whom they did cooperate.

Undoubtedly many lives were saved by this haphazard mode of operation, but at the same time it had some ill effects. The unscrupulous mingled with the well-intentioned, and their actions were not questioned in the urgency of the task. Among the people who rushed into the blast area were those described in Texas City as "the vultures." Within less than an hour after the explosion bodies were found with pockets rifled and ring fingers cut off. Added to the depravity of such actions, was the fact that clues to the identification of the dead were often destroyed or removed. Also contributing to the problem of personnel accounting was the fact that a few ambulance drivers from funeral homes "stole" bodies, removing them to undertaking establishments in distant cities without consideration of the problems of identification. Some lives may also have been lost because of this commercialization of catastrophe, for the living were sometimes passed by in the quest for the dead.

In the latter part of the Period of Immediate Reaction order began to emerge. Directors of various phases of rescue work were appointed, and police control of the blast area was firmly established under the leadership of a police captain from Houston.

RELIEF AND MEDICAL SERVICES

While rescue work was the first order of business during the Period of Immediate Reaction, the activities subsumed under the heading of "relief" began simultaneously. Food and clothing for both victims and rescue workers were needed. One of the greatest needs in Texas City was for gloves for the men working in the wreckage. The strain and the fatigue produced by strenuous rescue operations also gave rise to demands for vast quantities of hot coffee. Organizations such as the Red Cross and the Salvation Army foresaw these needs and soon set up canteens in

various parts of Texas City. These relief stations were set up independently and somewhat randomly, with no general planning. Relief workers saw stations were needed in the blast area, at the morgue, near hospitals, and throughout the business district, and set them up in available spots. Unorganized volunteers lent assistance in operating them. Before noon of 16 April the Army brought in facilities and supplies for mass feeding.

Closely integrated with rescue work was medical service. The tremendous number of injured persons, some 4,000, was far too great for the normal medical facilities of Texas City to accommodate. The city's three small clinics, damaged in the explosion, lacking adequate equipment and supplies, and virtually without water for several hours, could serve only as aid stations and clearing points for the hospitals of Galveston, Houston, and other Texas cities. Even during the Period of Impact, they were overrun with casualties from Zones II and III. By the beginning of the Period of Immediate Reaction, the more serious casualties from Zone I began to arrive, most of them brought there in private cars. The clinics were already so crowded that some of the injured had to be laid on the ground outside. Inside, the doctors and nurses, even with the assistance of medical people from neighboring towns, could do nothing more than frantically or frantically to keep life going until patients could be removed to larger hospitals.

Fortunately, medical supplies began to arrive from a variety of sources including the Red Cross, the Army, the Navy, various municipal hospitals, and private doctors. Many medical personnel, including Army and Navy units, reported directly to Zone I and took part in rescue and first aid work there. The rapidity with which medical assistance was brought in and casualties evacuated was due in large part to the activities of Civil Aeronautics Authority personnel. Within two hours after the blast, air traffic controllers were operating an efficient airport at the city's little airfield, with the use of an emergency radio truck.

Then there were the dead. During this early period rescue workers generally disregarded the dead in removing the injured, but many of the injured were "dead on arrival." In the critical situation it was not always easy to distinguish the living from the dead. A classic story is that of the rescue worker who stopped to feel a man's pulse and concluded that he was dead. Only then

did he notice that the man had no head. Under such conditions, it is not surprising that corpses began to arrive at the aid stations as soon as did the injured.

A large, centrally located embalming room and morgue was needed. A local undertaker obtained the use of a large garage on the main business street, just across from the high school gymnasium. The garage was used as an embalming room; and after emergency processing (often including reassembling) the bodies were laid out in the gymnasium for identification and claiming. But even in death there was confusion. A host of morticians who assembled in Texas City were confronted with the task of preparing bodies many of which were gathered in fragments, charred, turned inside out, or stripped of all but a few shreds of clothing. Identification experts equal to the task were not available in Texas City for several hours.

Confusion stemmed from two sources. The first was the unfamiliarity of rescue workers, and others handling bodies, with the nature of items that could be used for identification purposes. The second was the fact that, during the period of immediate reaction, access to the morgue was too easy. Not only anxious relatives and friends, but morbid sight-seers filed between the rows of bodies. Systematic methods of identification were notably lacking and the morgue was a scene of great confusion. This difficulty was finally ended when the Chief of the Bureau of Identification of the Texas State Department of Public Safety arrived with a staff of experienced identification experts and knowledge of scientific identification methods.

COMMUNICATIONS

During the Period of Immediate Reaction problems of communication, which were to prove great during the entire disaster, began to appear. Most of these problems arose from the pressing demands of large numbers of people for information in a highly ambiguous and, at the same time, critical situation. In normal times, the demands of the general public for information are comparatively small. News of local, national, and world affairs is disseminated at regular intervals by the press and the radio. The demands of a few individuals for specific items of information, arising between the times of these regular reports, are

easily satisfied by telephone calls to appropriate sources. In disaster-stricken Texas City, however, the number of individuals demanding information increased manyfold, for their normal assumptions as to the whereabouts of relatives, their own personal safety, and even where their next meals would come from were no longer valid. At the same time, the means of communication were no longer capable of even normal functioning.

The problem of communication between the officials in Texas City and sources of aid outside the city was quickly solved. Even though normal telephone service was disrupted, a few long-distance circuits were still available. By noon on the day of the first blast a police radio net had been established within the Texas City area, and police and Army transmitter guaranteed contact with the outside world.

The many people in Texas City, both local residents and outside helpers, needed to know what was happening, however, and there were some who were only too ready to tell them. Within an hour, sound trucks, operated by unauthorized persons, were touring the streets broadcasting announcements with little regard for their authenticity. One public address system was set up just outside the City Hall. The mayor and other officials found it useful for broadcasting valid information, but they discovered later that the private operator was also accepting announcements from unreliable sources. Other persons who had no broadcasting facilities at hand rode through the town shouting warnings to the residents. In the absence of well-defined and authoritative sources of information, rumors spread rapidly by word of mouth.

The most damaging type of rumor that was spread by these agencies consisted of false warnings of new threats. The same people who had been so callous to the actual threat of the burning "Grandcamp" were now sensitized to any suggestions of threat. The alarm, "Get out of town -- there's going to be another explosion," was repeated again and again, although responsible officials at no time ordered evacuation of the town. People who had disregarded the "Grandcamp" fire and, even after the explosion, had set about cleaning up their damaged homes now became frightened and left the town. The mass evacuation that had failed to appear in the immediate wake of the explosion gradually developed during the day.

Another type of information that was needed was news of those who had been killed, those who had been injured and where they had been hospitalized, and those who had survived. Much of the confusion at the morgue arose from a lack of such information and the resultant searching among the dead for relatives who were alive and safe. Several people attempted to meet this problem by setting up registration and information centers, where lists of the dead, injured, and living were compiled. Even in this effort there was some confusion, however, for these centers were set up independently; there was duplication of effort, and there was no central source of such information.

COORDINATION AND CONTROL

It has been seen that during the Period of Immediate Reaction effective but largely uncoordinated action was being taken in many phases of disaster work. Even while the people already on the scene labored, more and more workers were pouring into the town, asking the question "Where am I needed?" and usually getting in the way until it was answered. An unofficial disaster headquarters had sprung up at the City Hall, but there were severe limitations to the effectiveness of its operations. The mayor and the chief of police were commanders without a staff, with only a sketchy estimate of the situation, no plan of operation, and with little knowledge of the size and disposition of their forces. Yet reinforcements, badly needed and begging for assignment, were crowding around them.

They met the situation by decentralizing command functions and making up a plan as the situation developed. The heaviest burden fell upon the chief of police, who was in a position somewhat analogous to that of a chief of staff. Until outside help arrived, he dispatched the few available police officers to take charge of small but essential tasks. The first outside assistance arrived in the form of 50 uniformed police officers from Houston, under the command of a police captain. Not through any planning, but as a result of normal police training, this officer placed his force at the disposal of the local chief. The Texas City chief asked him to take complete charge of police activities in the dock area. Thereafter the local officer's only concern with this area was the dispatching of additional policemen to report to his new subordinate. In similar manner he delegated the task of traffic

control to the ranking officer of the Texas State Patrol, and the task of internal law and order, including prevention of looting, to a captain of the Texas Rangers. Smaller police forces were assigned as units to work under these three "field commanders." A police headquarters equal to the magnitude of the disaster was organized, using qualified personnel regardless of rank or organization. Two officers in a radio-equipped car served as the intelligence arm of this headquarters, cruising the entire disaster area and reporting any problems they discovered.

By the end of the Period of Immediate Reaction an efficient, well-integrated police organization had developed. But it could not have developed in the way that it did had not police forces coming to Texas City from other parts of the state reported to the local chief of police. Because they did so, he was able to coordinate their activities and develop an organization, even though he was forced to build it up piece by piece.

Towards the end of the Period of Immediate Reaction, the mayor also had delegated the responsibility for other tasks. A coordinator of rescue activities was appointed, a local doctor was asked to coordinate medical activities, and, finally, a deputy mayor was designated, primarily to serve as a public relations officer. The assistant fire chief had returned to the city, having escaped death only because he was away on business at the time of the explosion. He took charge of the task of coordinating the fire-fighting activities of the many fire departments which had rushed to the city. Both the Red Cross and the Salvation Army had directors in charge of their respective relief activities, and the Army and Navy also had well-organized units in operation in the city. One of the most revealing commentaries on the Period of Immediate Reaction is that shortly before noon the mayor of Texas City was ready to have martial law declared, so great was the confusion. His chief of police dissuaded him in that time, and by 1400 hours such an effective disaster organization had emerged that it was evident to all that martial law would not be needed.

PERIOD OF EMERGENCY

Although the critical Period of Immediate Reaction lasted for only a few hours, Texas City remained in a state of emergency for at least a week after the "Grandcamp" blast. The principal difference between the two periods was the fact that during the

former there was no community-wide disaster organization, although one was developing; while, during the latter, there was an emergency organization which was able to cope with the special problems that arose.

By about 23 April, a week after the disaster, the people's fears of further calamity were largely allayed. Those who had fled the city but had homes to return to were being admitted, and most of the outside forces had withdrawn. People were turning again to their normal "missions."

However, the Period of Emergency was characterized by two outstanding problems: a continuing state of susceptibility to any suggestion of threat, and the development of administrative problems.

THE PROBLEM OF THREAT

The people who remained in or came into Texas City after the "Grandcamp" explosion were highly sensitized to suggestions of further danger. About one hour after the blast, irresponsible, although well-meaning, individuals began to create mild panic by broadcasting warnings throughout the city. These warnings had the most effect in areas where people had little access to the realities of the situation. Rescue workers in the dock area, where the danger was alleged to be the greatest, paid little attention to them. They could see what was happening. More important, they were doing a job which demanded all of their attention; consequently they had no time for rumors and alarms. Indeed, when a legitimate warning did come, some of them disregarded it.

A genuine threat did develop during Wednesday, although it was not clearly recognized as such until late in the day. When the "Grandcamp" blew up, the S. S. "Highflyer," also loaded with ammonium nitrate, was wedged against another ship and set afire. There was much speculation as to how much real danger this second burning ship posed. Rumor had it that it might explode at any minute. On the other hand, some chemical engineers declared that there was no likelihood of an explosion. At about 0100 hours it was decided that the ship should be moved out of the harbor. This proved to be a difficult job, however, for the "Highflyer" was disabled and firmly wedged against the other ship. It could

be moved only by tugs. But a rumor that the ship was loaded with ammunition made it difficult to find tug crews who would approach the burning vessel. Not until late Wednesday night did four tugs move in to try to move the "Highflyer."

In the meantime, rescue operations continued nearby. By early in the afternoon most of the injured had been removed from the waterfront industrial area, and the job that remained was one of removing bodies and searching for signs of life amid the wreckage. During the Period of Emergency this work was well organized. An executive of the Texas City Terminal Company, well acquainted with the area, had been given general charge of the operations by the mayor. Two men experienced in the use of heavy construction and wrecking equipment directed the search. In accord with the instructions of identification experts, bodies were now being tagged with information as to their location, and all objects which might serve to identify them were being collected with the remains. Police control of the entire area was maintained by a well-organized force, with a public address system at its disposal.

So well established was the control of the work in the dock area that it continued with no major interruptions until after midnight, 16-17 April, while flames from the "Highflyer" shot higher and higher. Shortly before 0100 hours, Thursday, 17 April, another explosion appeared imminent to the men in charge of moving the ship. At that time the only official evacuation order issued during the entire disaster was given, and it applied only to the waterfront area. All but a handful of the workers in this area had evacuated when, at 0110 hours, the "Highflyer" went up in an explosion equal to or greater than that of the "Grandcamp" in intensity. There was more property damage as a result, but no deaths and very few serious injuries.

After the explosion of the "Highflyer" no genuine threat remained in Texas City. But rumors continued to circulate and cause sporadic flurries of panic until the following Tuesday. On Thursday, the day after the first blast, a report spread that poison gas was drifting over the entire town from the industrial area. On Friday, 18 April, city officials released the following statement to the Texas City Sun, which issued bulletins on both Thursday and Friday:

> In regard to the rumor that poison gas was sweeping into Texas City, all officers, including the mayor, attrib-

> uted the story to nerve strain and hysteria. A mortician, they said, requested a mask to be used in his work and a member of a relief organization called across a crowded room to "Get a gas mask," immediately throwing the entire company into panic. Occupants of the area began a frantic grab for the masks and the rumor spread throughout the town with amazing rapidity. There was and is no danger from poison gas, the officials said.12/

On succeeding days and as long after the first explosion as Tuesday, 22 April, it was necessary for city officials to issue denials of reports that burning oil and gas tanks and ammonium nitrate burning in the wreckage of warehouses threatened the city with further explosions.

It is not the nature of these rumors, but how they were disseminated, that is significant. Early in the Period of Emergency, the police brought intra-city broadcast facilities under control, recognizing the damage which they were doing by irresponsible announcements. But it was impossible to control the spread of such reports by word of mouth, and no well-defined source of authoritative information which might have counteracted rumors ever came into existence. The mayor appointed an assistant to perform this function, but the general public never became fully aware of his role.

Another potent but uncontrolled source of false alarms was external to Texas City, namely, radio newscasters. As soon as power was restored to Texas City and the people there could listen to their radios, they began to hear highly dramatic and often alarming accounts of what was going on within a few thousand feet of them. Rumors which were at the very moment being denied by officials in Texas City were, at the same time, being broadcast to the residents over national networks as "news." As late as Sunday night, when all danger of further explosions was passed, a nationally-known news commentator broadcast that Texas City was threatened with a "new series of explosions."

PROBLEMS OF ADMINISTRATION

Although the problem of controlling communications facilities was never satisfactorily solved, there was another aspect of the

12/Texas City Sun, Texas City, Texas, 18 April 1947.

problem besides that of rumor control. This was the communication of accurate information to the outside world as to the needs of Texas City. By Thursday most of the new workers and supplies arriving in the city were not needed, but this fact was not effectively communicated to the outside world. Moreover, both commercial and amateur radio stations continued to broadcast appeals for more assistance. Eventually it became necessary to turn back some people who were coming to Texas City to render assistance.

Greater success was achieved in the area of traffic control. The threat of traffic congestion became acute again on Saturday and Sunday, when thousands of week-end sight-seers drove towards Texas City. But, fortunately, by this time a tight traffic control net had been established by the state patrol and the curious were turned back at outlying roadblocks.

City officials and the white residents of Texas City still maintain that anti-looting measures met with a high degree of success. Negro informants contend, however, that their section of town was not protected and that looting was rampant. Police records provide no accurate measure of the amount of looting, for successful looters would not have been detected, and looters who were caught were not often booked. During the stress of the emergency period, they were generally taken to the edge of town and told to "get going." While an effective police guard was unquestionably established throughout most of the town, Negro informants declared that there were no guards in their district -- "We were left out just like we always are!" When asked if Negroes reported looting losses to the police, a Negro leader replied, "Naw -- I'll tell you how they reported it. They went to the Red Cross and told 'em they'd lost everything they had."

During the Period of Emergency most of the disaster work in Texas City was actually being done by a host of out-of-city agencies and volunteer workers. There were few conflicts between the local people and these outsiders, particularly on non-administrative levels. As the local informants explained it, "At a time like that you don't care who's working -- just so they're helping out." This lack of regard for personal identity did make easy the operation of a minority of unscrupulous racketeers who invaded the city.

In most areas of operation, conflicts between local authorities and officials of outside agencies were avoided by the outsiders assuming positions at least nominally subordinate to the Texas City leaders. The relationship of outside and local police officials has been described. Another example of harmonious collaboration was found in the identification proceedings. After mid-afternoon of 16 April, the technical knowledge and much of the manpower for the tremendous task of identifying 385 shattered bodies were provided by the State Bureau of Identification. Yet at all times the state experts communicated with the public, announcing instructions and reporting identifications, through a local "Dead Body Commission."

The only serious administrative conflict arose in the field of relief. Tension between the Red Cross and some local officials which had been building up since Thursday or Friday burst into the open on Sunday, 20 April, when the mayor openly accused the national agency of rendering little assistance to the community, refusing some individuals aid, and seeking to claim credit for the lion's share of the work. News releases reporting the mayor's criticism of the Red Cross were accompanied by others which indicated that another agency, the Salvation Army, was receiving no criticism. Although Salvation Army officials were not directly involved in the controversy, the organization was and is held up by many people in Texas City as one which "did a better job than the Red Cross." With no implications of discredit to any of the parties involved, the relationship between these two outside agencies and local officials, as well as their methods of operations, may be analyzed.

As has been shown in the discussion of the Period of Immediate Reaction, the first Red Cross workers in Texas City were small groups of professional and volunteer relief people from nearby towns who rushed in and went to work where they were needed. Later, during the Period of Emergency, regional and national officials came in with a large, quasi-governmental relief organization. By proclamation of the Governor of Texas this was the official relief organization in Texas City. The local Red Cross chapter was disorganized and not functioning. Although the chairman was at work operating a registration and information center, he was not given even a nominal position of leadership in the emergency organization. It is understandable, in view of the magnitude of the task before them, that the trained, profes-

sional leaders from outside the city took charge. Furthermore, since the Red Cross charter makes a clear distinction between Red Cross relief activities and the rescue and police functions which are a governmental responsibility, these leaders apparently felt no call to subordinate themselves to city officials in their work.

Certain normal features of standard operating procedure also caused misunderstanding of the motives and methods of the Red Cross. One was the use of scientific, discriminating methods in dispensing relief. Applicants were questioned and some proof of the legitimacy of their requests was sought. Another was the seemingly inconsequential practice of posting signs identifying relief stations as Red Cross installations. A third practice was one not unexpected in a large, permanent organization: that of issuing statements to the press through public relations officers.

These procedures were interpreted as other than normal and proper by some of the people in Texas City. To them, systematic relief distribution smacked of "red tape" and cold-heartedness. Press releases emphasizing the contribution of the Red Cross led some local people, including the mayor, to feel that the leaders of the agency were committing two unpardonable sins: (a) They were trying to establish dominance in a cooperative endeavor in which many people, including a small but valiant band of local workers, were giving their all; and (b) they were seeking to gain publicity and acclaim for their organization through Texas City's tragedy. The fact that the Red Cross leaders had not, of course, come to the city until after the first tragic blast added to this feeling, albeit illogically. The local mayor also felt that the organization was operating too independently in a city in which he was still officially the leader. He finally attacked the Red Cross in a bitter statement:

> You people have done a lot of work in answering telegrams, but when it comes to the real relief that has been given to the people of Texas City, it has not come from the Red Cross. 13/

After an unfortunate public exchange of acrimonious remarks, the mayor and the Red Cross officials resolved their differences and

13/ Associated Press wire release, Texas City, 20 April 1947.

satisfactory cooperation was achieved. Two Red Cross representatives were assigned as liaison agents in the mayor's office and joint press conferences became the rule.

As a result of this dispute, however, much harm had already been done. Three years later sharp differences of opinion as to the role of the Red Cross still existed in Texas City. Doctors, particularly, insisted that the organization's assistance was invaluable. Critics, on the other hand, still charged that the national officials sought to "run the whole show" and to obtain valuable but undeserved publicity from the community's calamity. An additional type of criticism attained the status of a legend among a part of the population: the story that professional Red Cross workers stayed in places of safety and avoided the blast area. The evidence indicates, however, that Red Cross workers left the dock area only when ordered to do so before the "Highflyer" blast.

In contrast, the Salvation Army had a relatively small organization operating in Texas City. Furthermore, it was essentially a religious organization, operating on what may be described as a "charitable" basis, and with no official status. The workers came into the city, asked city officials where they might set up their relief stations, and went to work. Food, clothing, and cash were handed out freely to anyone who appeared to need them. No signs were put up at Salvation Army stations, and many of the workers had no uniforms. There were no public relations officers. One member distinguished himself, unnecessarily and to no avail, by remaining in the dock area after the evacuation order; and he was one of the few people seriously injured in the "Highflyer" blast. It was not the amount of aid dispensed by the Salvation Army, small in comparison with the huge quantity offered by the Red Cross, that was impressive to many Texas City residents. It was the quiet, open-handed way in which it was dispensed that they noticed. Enhancement of the contribution of the Salvation Army seemed to vary directly with deprecation of the role of the Red Cross. If there was ever any conflict between the two organizations themselves, however, it has not been brought to the attention of the public.

THE END OF THE EMERGENCY

By Tuesday, 22 April, all the fires in Texas City had burned out or been extinguished. After the week end, outside police

forces were no longer needed. Ample equipment for salvage work was on hand. Evacuees had begun to drift back into the city, and on Wednesday the mayor broadcast an appeal for all who had homes to return to them. A memorial service for the dead had been held the previous Saturday, but bodies were still being found and a tremendous task of identification remained to be done. The injured were all in hospitals, however, and the homeless had shelter which would serve until their homes could be rebuilt. On 23 April, one week after disaster had struck, the Texas City Sun declared, "Texas City moves forward into its reconstruction period."[14]

PERIOD OF REHABILITATION

It may be said accurately that the Period of Rehabilitation had not ended for Texas City in 1950, for some survivors were still receiving rehabilitation funds from the Red Cross at that time. It is the earlier part of this period with which this report is concerned, however. Rehabilitation began even during the Period of Emergency, largely on a private basis, as merchants began to refurnish their stores and reopen them for business. On 20 April the Republic Company asked its employees to return to work, and on 24 April Monsanto announced that hourly employees would be given work dismantling and rebuilding its plant.[15]

These private activities were important in restoring an air of normalcy to the city. Reopened clothing and food stores obviated the need for relief stations. The resumption of work by industries, even the stricken Monsanto Company which announced that it planned to resume production within six months, assured local residents that there was still a future for them in Texas City and provided them with immediate employment.

The community, as a political unit, as well as many individuals, still needed help, however. The Red Cross appropriated huge sums of money for the relief of individuals, and large contributions directly to the city itself poured in from all over the world. A bonded relief committee was established to receive and disburse the latter. In accordance with standard practice, the Red Cross asked for the appointment of a local committee to

14/ Texas City Sun, 23 April 1950, p 1.

15/ Ibid., 20 April and 24 April.

review all grants to individuals and families. In spite of this, the time-consuming case-study procedure and the principle of granting assistance on the basis of need rather than loss caused some misunderstanding and resentment towards the national organization.

Another important Red Cross activity was the operation of a shelter for 1,250 homeless persons at a wartime army camp near Texas City. A council form of self-government was established by the residents, and trained Red Cross workers provided recreational services for both children and adults. Most important, however, buses ran daily from the camp so that homeless workers could continue their work in Texas City.

There were also problems of psychological rehabilitation. An estimated 512 people were dead or missing after the disaster; and Texas City was a town full of bereaved people, many of them not even knowing what the fate of their loved ones had been. Some relatives labored for months with identification experts seeking to establish for certain the death of a husband or other close kinsman. Yet, in the midst of all this tragedy, few people broke; no suicides and only two or three acute psychoses were reported. Statements of people who suffered bereavement and of those who were closely associated with them indicate that it was group support and group pressure that sustained them. "We were all in the same boat!" A man described the mutual support provided each other by a group of widows:

> It seems that there being so many people in the same boat meant that no one felt that she could demand sympathy from others. If there had been just one widow, she might have shown her feelings. But there were so many widows. They seemed to support each other.

The adage, "misery loves company," contains the important truth that one of the most severe forms of human deprivation is isolation. The people of Texas City were placed in a terrible situation, but one which they all shared. Each individual was assured of the sympathy and understanding, even though unspoken, of many others who shared his misery. At the same time, the individual who gave way to his most despondent feelings might fear the silent reproach of those whose loss was as great or greater.

The tension and alertness to threat which developed in Texas City with the "Grandcamp" blast did not disappear at the end of the Period of Emergency. For weeks afterwards the sound of a siren or the sight of smoke rising from the waterfront was enough to arouse fears and start some people on their way out of town. But even this tension soon wore off. Some three months later the police had difficulty keeping sight-seers from crowding into the dock area to watch an oil tanker burn!

TEXAS CITY: CONCLUSION

When the magnitude of the disaster is considered, the speed with which Texas City recuperated seems extraordinary. It seems even more remarkable in view of the fact that the community had no effective disaster plan. The organization which emerged to cope with the disaster was an ad hoc one, but it functioned efficiently. It must be recognized, at the same time, that there was some preparation for this catastrophe. There was preparedness in the organization of Red Cross chapters in surrounding cities and on a nationwide scale, and in the training of police forces throughout the state of Texas. Because of this the unscathed area peripheral to Texas City was the source of speedy and effective assistance without which the stricken community would have been helpless.

At the time of this investigation, in 1950, Texas City showed few physical evidences of its tragic past. Less tangible signs were present, however. One was a feeling of pride in the community that had risen from ashes. The other was a marked suspicion of and hostility towards investigators who inquired too closely into the details of the disaster. Many damage suits against the federal government are still in litigation, and local residents are afraid of government agents seeking evidence. They are also intensely conscious of the industrial importance of their community for national defense and have a real fear of spies. Finally, they are very weary of being "investigated."

TORNADO TOWNS

Although the devastating force of a tornado has an origin different from that of an explosion, the two types of disaster have much in common. Both are unexpected and both create situations in which normal expectations are obviously unreliable. They have physical similarities, also. In both there is a tremendous air blast, flying debris, shattered glass, and collapsing structures. In both people may be killed, injured, or made homeless; community facilities -- power, gas, and water -- may be disrupted. The demands for rescue, relief, and police activities are similar.

A tornado differs from an explosion, however, in some of its results. In the first place, there are usually more definite warnings of the imminence of a tornado, though they may appear only minutes before it strikes and may not be recognized even then. Hence there is always a period of threat, no matter how brief, before the impact of a tornado. This is frequently not true of an explosion.

Another important difference is that the tornado does not create the same zones as does an explosion. It was shown that the Texas City explosion resulted in the creation of three roughly defined zones within the disaster area, varying in physical destruction, bodily injury, and social reactions. But in all the tornado towns studied, only two zones were created within the stricken town, and these were sharply differentiated. In a tornado-stricken town, there is a zone of complete destruction with many of the characteristics of the central zone of a blast area: demolished structures and many deaths and injuries from bodily displacement or flying debris. Fires which may be started by the scattering of open fires or the rupture of gas mains develop relatively slowly, if at all. Instead of being roughly circular like the central zone of an explosion, the Zone of Destruction after a tornado is a long, narrow path sometimes several miles in length. Along the edges of this path there is no zone of extensive damage

shading off into areas of less and less damage. There is only a zone of light damage, damage of the sort that might result from any hard but not disastrous windstorm. After a tornado, only a few feet may separate completely demolished buildings that were in the path from unscathed structures which were not. In many cases residents of tornado towns who did not hear or realize the significance of the roar of the storm were unaware that a tornado had passed nearby.

Finally, after a tornado has passed through a town, there is no further threat of catastrophe, even in its path, unless secondary fires grow to holocaust proportions. There may be danger from live wires but these can be avoided, and it has been found that fear of them has not acted as a deterrent to rescue workers. The fact that no panic flight from the immediate periphery of the Zone of Destruction was found in tornado towns seems to be explained satisfactorily by this absence of a continuing threat. Except for the flight of the injured towards sources of medical aid, the only mass movement found in tornado towns was a rush into the Zone of Destruction by rescue workers and anxious relatives.

These common elements were found in four Oklahoma tornado towns which were investigated. The socio-psychological reactions of each of the four communities are described in the remainder of this chapter.

WOODWARD: 9 APRIL 1947

Just one week before the Texas City explosions a tornado swept through the town of Woodward, in northwestern Oklahoma, leaving 95 dead, nearly 500 injured, and about the same number homeless. The zone of complete destruction, a mile long and half a mile wide, included a large part of the residential district of the small town.

Woodward is not an industrial community like Texas City, but is a service center for a prosperous farming and livestock area.

In 1940 the town had a population of slightly over 5,000 people, almost exclusively native white.16/ It had a mayor and city

16/US Bureau of the Census, Sixteenth Census of the United States, 1940, Population, "Characteristics of the Population: Oklahoma" (Washington: US Government Printing Office, 1941) Table 30, p 132.

commission form of government. There was a police force of half a dozen men, and a small volunteer fire department. As the county seat, Woodward was the headquarters for the sheriff of Woodward County and his one deputy. Two state highway patrolmen were also stationed there.

The local Red Cross chapter had a disaster organization. According to the leaders in the organization, however, the members of the various committees did not take it very seriously. It was just another type of community "club work." In fact, although small tornadoes had swept near Woodward in the past, the people of the town gave little thought to the possibility of a catastrophe from this source. As in many Oklahoma towns, there was a folklore declaring the town safe from tornado damage because of certain geographic features. There was an old Indian legend that a hill southeast of town would protect it from a twister and, after all, there had never been a disastrous storm in Woodward.

There was nothing unusual about the weather Wednesday, 9 April, to suggest the possibility of a tornado to the residents of Woodward. The day had been pleasantly cool, with a little rain. There was none of the ominous, oppressive heat which so often precedes a tornado. After supper, the people went about their evening activities. The two movie theaters on the main business street filled up, as did a drive-in theater on the outskirts of the town. A small crowd also gathered at the Presbyterian church for a board meeting. Families gathered in their homes; young men went riding with their girl friends.

Shortly before 2100 hours the wind rose, and brilliant red flashes of lightning could be seen to the southwest of town. The lights went out all over Woodward. Almost immediately a roaring noise was heard -- "like a freight train going through town," residents said -- and the twister swept into Woodward. In two or three minutes it had moved on northeast into the open country.

Even thought the Period of Threat was very brief, a few people recognized the roar of the approaching tornado for what it was. They had experienced similar storms before. Some were virtually helpless -- they had no cellars to which to retreat. A few fortunate ones did. One man 81 years old found time to summon his daughter from her house next door to the safety of his cellar. Another man, a combat veteran, a survivor of another tornado,

and the head of a family, took positive, heroic, but perhaps foolhardy action. His story is as follows:

> I was sitting in a cafe, down the street from the theater where my son and daughter were. My wife was at a meeting at the church. I knew a tornado was coming when the pressure started hitting my eardrums -- I'd been in one before. As soon as I felt it, I started out the door. I hardly remember what happened after that. You don't act like a human being when something like that happens -- you're just mechanical. I knew my kids were in that theater and I was going over there. I just kept charging that wind like I was playing football and I went down 20 times between the cafe and the theater.
>
> When I finally got there, the people inside were crying and trying to get out the door. I knew that if they did they'd be killed, and my kids were in there. I just held those doors shut. One fellow kept trying to get out and I finally slugged him.
>
> The whole thing didn't last long, I guess, but it seemed like I held that door for ages and ages.

This man's actions were not planned, and, according to his own account, he was scarcely conscious of what he was doing. He was acting "mechanically." Nor was he motivated by any desire to serve the people of the community. He fought his way to the door of the theater because his children were there, and he kept the whole crowd from pouring out into the teeth of the storm for the same reason. Yet his spontaneous action undoubtedly saved many people from death or serious injury.

Other people in the path of the tornado were not so fortunate. Many were killed or seriously injured, and some were trapped under the wreckage of their homes. Survivors who were conscious after the storm had passed reported that they were dazed, but still able to do something. One young man with a broken back managed to lift his unconscious girl friend into the seat of an automobile before passing out.

There was also a tendency for the survivors to assume that the disaster was localized; that there was no more destruction than they could see about them. No one realized that over half the town had been laid waste. The primary reaction in the Zone

of Destruction was concern for relatives and neighbors living nearby. As in Zone I in Texas City, there was spontaneous, informal, small-group organization for rescue work. In addition, the intimacy of small town neighborhoods made possible highly accurate checks for missing persons.

Two buildings in the path of destruction caught fire from an open blaze that had been burning before the storm struck. The glow of the fires attracted some survivors from their immediate neighborhoods. An off-duty policeman proceeded immediately to one of the burning buildings for possible rescue work and to assist firemen whom he expected to find there. Some businessmen thought that the blaze was in the business district and went there to check on their stores.

There was a variety of reactions in the lightly damaged zone outside the path of the tornado. Some people knew that there had been an unusually severe windstorm, but seeing only the relatively light damage in their own area were not unduly alarmed. Others realized that this was no ordinary windstorm but a disastrous "twister." In the darkness, they could not tell how much damage had been done, but they rushed to the homes of relatives and friends to inquire as to their safety. As they moved through the town they began to realize what had happened. One man started to his home to see what damage had been done; he had already found his family safe. It was 12 hours before he reached his home, for on the way he encountered so many injured people that he converted his car into an ambulance for the rest of the night.

Woodward's disaster organization failed to function. One of its leaders declared afterwards, "When I walked out of my office and realized we didn't have a real plan I felt like going through the sidewalk." Nor did the established local leaders assume positions of general leadership, although they were active. The police force was scattered about town engaged in unrelated, though important, tasks of rescue and traffic control. The chief, rushing from his home towards his office, stopped on the main business street and became a mere guard, protecting the stores there from looting. The fire chief and a few of his men who were on duty carried out their assigned roles, going out to fight fires that broke out. The sheriff became involved in rescue work; several branches of his family had lived in the path.

The actions which led eventually to the emergence of community organization were those of one of the two state highway patrolmen. But he did not assume a position of leadership as quickly as he might have. When the storm struck he was at the city hall, outside its path, and it was not until he had driven into the Zone of Destruction that he realized the seriousness of the situation. Then he discovered that fires had started in the wreckage and went to the fire station to notify the fire department. After that, he started towards his home to find out about his family. But before reaching home he stopped to take some casualties to the hospital. It was not until after he had found out about his family that he assumed the role of an over-all leader. Finally realizing the magnitude of the disaster, he resisted the temptation to continue rescue work as an individual and drove out of town to seek help.

As the trooper sped towards a small town some 20 miles away he met two private cars on the road. He dispatched both of them to other nearby communities, asking that they call State Patrol headquarters in Oklahoma City. When he himself reached the small town which was his destination, he stopped at the first public gathering place he saw -- a beer tavern. In his own words, this was what he did next:

> Fortunately, the tavern was full of men. I told them that Woodward had been blown away by a tornado and that a lot of help was needed. I asked them to get all the men they could find, organize into groups of five, and meet me at the community building in Woodward as soon as possible. They were ready to go right then -- they didn't even ask me any questions.
>
> I went on to the telephone exchange and called patrol headquarters at Oklahoma City, Clinton, and Enid. As soon as I got back to Woodward I went to the hospital. Some other men and I cleaned out a room in the basement to be used as a morgue. I left the other men in charge of that, and I went back to the community building. By the time I got there the first carload of men from Seiling was driving up.
>
> I had found a loudspeaker at the hospital; I located some batteries to operate it and set it up at the community building. Then I started sending groups of five men into each block in the torn-up part of town. They were

told to look for the dead and injured and also to prevent looting. I also sent five-man teams down each street to try to clear them and to watch for signs of looting.

There was no difficulty in getting men to work. Soon there were hundreds of men, from Woodward and surrounding towns, standing around the center waiting to be assigned. I did try to see that there was one man from Woodward, who knew the town, in each group. I knew where to assign the teams myself because I know this town like the palm of my hand.

As a result of this man's leadership, a genuine disaster organization, at a centrally located headquarters, was in existence when, at about 2400 hours, the bulk of the outside help began to pour into the small town. This headquarters was well-located. It was near, but outside of, the Zone of Destruction. It was also at a "natural" center in the town, at the community center where there were clustered the police station, the city hall, the fire station, and the civic building. As outside workers came in they easily found this headquarters and fitted themselves into the existing organization. No administrative conflicts developed. Part of this harmony may be ascribed to the fact that the local man who had assumed command had a dual status: he was a familiar figure to the people of Woodward, and at the same time was a representative of a state organization.

In spite of the emergence of this efficient organization, the Period of Immediate Reaction did not end until daylight, 10 April, the day after the tornado struck. This is explained by the fact that the disaster occurred at night. The darkness led inevitably to confusion, anxiety, and an inability to determine how much of the task of rescue work had been accomplished. Adequate emergency lighting equipment, portable generators and floodlight, would have done much to alleviate this situation. With the return of daylight, however, it was found that all of the injured and most of the dead had been evacuated from the Zone of Destruction. The mayor summoned members of the city commission and other community leaders to a meeting, and emergency committees were appointed.

During the night the problems of medical service were so great that the town's one small hospital was entirely unequal to the task confronting it. As in Texas City, the "walking wounded"

began to arrive at the hospital as soon as the doctors did. At the same time, impromptu first-aid stations, without doctors, sprang up in undamaged buildings, such as churches. The president of the County Medical Association, a doctor who was on duty during the disaster, had this to say about the medical service:

> The hospital was nothing more than an aid station. We had so many people that all we could do was give first aid. People were lying in the hall and even out on the lawn. At first we all just pitched in and went to work as hard as we could. About 2230 I was able to send one doctor to one of the other aid stations.
>
> Before we got through we must have had about 40 doctors working, including the ten from Woodward county. We also had the assistance of women with Nurse's aid training and some former army medical corpsmen whom I didn't even know lived here. Actually, we could have handled the injured with only seven or eight doctors if they had been organized properly. When the outside doctors started coming in, they didn't know where to go. I finally assigned one doctor to go out in front of the hospital and direct the new doctors and nurses as they came in. I should have done this sooner.

A communications problem also resulted from this lack of organization. The majority of the injured persons were evacuated to hospitals in other towns after receiving emergency treatment. No one thought to keep a record of who had been treated and where they had been sent for hospitalization. Needless confusion and anxiety, lasting for over a week, was the result.

Other problems of communication were not serious. No rumors of additional threat were circulated. What rumors there were consisted of exaggerated stories of the destructiveness of the storm. Anxiety and tension were increased by false reports of death or serious injury to people who were only slightly injured or were entirely unharmed. But the operation of an information and registration center, started the night of the tornado by the city clerk, helped to reduce this anxiety.

Serious problems of traffic control did not arise until the week end when sight-seers began to move on the stricken town. But state patrolmen were able to meet this problem with road-

blocks. Some roadblocks were established the night of the storm by local policemen and later by state troopers. It was impossible, however, to screen looters from legitimate rescue workers, and there was some looting. But the guard which was established simultaneously with the development of a rescue organization kept this to a minimum.

Rehabilitation was accomplished through a combination of local and outside aid. Local people whose homes were intact opened them to the homeless, so that few people were forced to live in the Red Cross shelters which were erected. The National Red Cross spent almost $1,000,000 on the rehabilitation of families.[17] Only slight criticism of the Red Cross was heard in Woodward. Most of this stemmed from people who did not receive as much assistance as they hoped for, but in some cases these people had not even asked for assistance! A bonded committee was set up to administer a fund for the rehabilitation of public buildings and the clearing of streets. The money in this fund came from contributions made by neighboring towns.

Psychologically, the disaster had a lasting effect on the people of Woodward. Almost every house in the town now has a storm cellar. And the town has a disaster plan which the people take seriously. Finally, the people are "tornado-conscious." A man who moved to the town after the disaster said of the older residents:

> These people are tornado-happy. Everytime a dark cloud comes up they go into their caves. A fellow can walk in a beer tavern on Saturday night, say "There's a storm coming up," and empty the place in a minute!

ANTLERS: 12 APRIL 1945

Antlers is a small rural service center in southeastern Oklahoma. In 1940, it had a total population of a little over 3,000 people, including 224 Negroes and 186 Indians.[18] It is located in a section of Oklahoma known as "Little Dixie" because of the prevailing racial attitudes among the white people. In Antlers,

[17] American Red Cross, "This Was Woodward, Oklahoma," Disaster, I, No. 5 (July-August, 1947) pp 4-5.

[18] Sixteenth Census, op. cit., Table 30, p 129.

the Negroes live segregated in a somewhat isolated hollow beyond the city limits. Except for a few professional workers serving the Negro community, they are employed only in domestic service and as unskilled laborers.

In 1945 the town was governed by a mayor and a small city commission. The real political leadership was exercised, however, by a powerful state political leader who resided there. The protective force consisted of two policemen and a volunteer fire department. There was no disaster organization, but the wartime Home Service Chairman of the county Red Cross chapter was a resident of Antlers. The town had no hospital and only three doctors. Psychologically, the residents were not "tornado conscious." A community could hardly have been more unprepared for disaster.

The tornado struck at 1845 hours. Because the town was on daylight-saving time, almost an hour of daylight remained. The path lay for the most part through a residential district, although one building on the edge of the business district was demolished. Electric service was temporarily cut off, and water gushed from broken outlets in the area, reducing the pressure over the entire town. Sixty-eight people were killed and 160 were injured badly enough to require hospitalization.[19/]

As in Woodward, the Period of Threat was of only minutes' duration, but some people were able to save themselves by falling flat or diving into ditches. Their reactions during the Period of Impact were similar to those found in Woodward. The people of Antlers described the informal, small-group action which emerged throughout the Zone of Destruction as "just being good neighbors." Those in the Zone of Light Damage thought first of relatives and friends, and there was a rush towards the path of the tornado as soon as it was realized that damage was extensive. The Negro community was not struck, but some who had seen the funnel joined the rescue workers. The majority of the Negro residents, however, were unaware of what had happened because of their physical isolation from the main part of town.

Most of the formal, established leaders in the town simply did not function in this crisis. No general, coordinating leadership from local sources ever emerged, although there were a few

19/ The Antlers American, Antlers, Oklahoma, 19 April 1945.

instances of leadership in specific, discrete situations. While not top-level public officials, each leader did occupy a position whose duties he considered to be important to the community. Furthermore, each one carried out these duties in the way that seemed appropriate in the situation. They did not conceive of themselves as community leaders, but each merely felt that he was "doing a job that had to be done." The significance of what each did proved subsequently to be far greater than any of them realized at the time.

This fact is clearly illustrated in the case of one of the volunteer firemen, who was also the serviceman for the city water department. This is his story:

> My house was just outside the path, so me and my wife wasn't hurt. The first thing I thought of was fires -- I knew there'd be some. I headed for the fire station and on the way I seen that a fire had started in the wreckage. When I got to the station, I was the only fireman there. All the rest of 'em had relatives that were hurt and they stayed with them. If it hadn't been that my wife was all right this town probably would have burned up -- I believe I would have been looking after my family, too.
>
> I drove the truck up to where the fire was and took the hose down. Some of the men around there helped me drag it over to the fire. There was dead bodies lying all around, but we just snaked the hose around 'em. It's funny -- I didn't think nothing about it then, but later on when I thought about it, it made me weak-kneed. I stayed there and put water on that fire until the Army got here and took it over. I didn't have to tell nobody to help me. The fellows around there saw what I was doing and just grabbed hold of the hose and helped me.

Unplanned leadership and emergency action are not the only patterns of behavior under stress exemplified here. In the readiness of bystanders to assist the fireman, without orders, is illustrated the susceptibility of individuals in a disorganized situation to suggestions for action: many people want to do something but do not know what to do. The "snaking" of the hose around human bodies without compunctions points to the focusing

of attention upon the salient features of a new situation and the disregard of norms appropriate to other, more normal situations. Later, after the stress of the emergency situation had disappeared, his own previous actions seemed unthinkable to the fireman.

The Home Service Chairman of the Red Cross was not part of any disaster organization, but felt that he should do something since he was a member of the Red Cross. He rushed to the telephone exchange and attempted to call the Regional Office in St. Louis. Unable to get that office, he called an Oklahoma City radio station and asked that an appeal for help be broadcast. Then he called an army camp some 50 miles from Antlers and asked for assistance. After having made sure that outside help would come, he set up a registration center in the city hall to compile lists of the dead and injured.

A third man who contributed to reorganization was the manager of the local power plant. His attention to his duty of restoring electric power to the town as quickly as possible led directly to the establishment of two first-aid stations. Ascertaining which wires could be quickly restrung, and where electric service would be out for several hours, he gathered a few people together to set up aid stations at points where lights would soon be available -- the Methodist church and the high school gymnasium. He then proceeded to the power plant and set about restoring electric service to part of the town.

In spite of these instances of local leadership, the people of Antlers, including the man who was mayor at the time of the disaster, agree that community-wide reorganization did not take place until after the arrival of a large contingent of troops from Camp Maxie, Texas. In the words of the local residents, "When the Army came in they just took over. We were glad to have them do it -- we would have been helpless without them." The Army provided medical personnel for the operation of the aid stations, rescue teams to complete the search for the injured and dead, men to assist in fire-fighting and turning off water outlets, and guards to maintain order and prevent looting. Most of the residents accepted this unofficial martial law willingly, although a few objected to having to ask military guards for permission to search the wreckage of their own homes.

By the morning after the tornado struck the critical Period of Immediate Reaction was over. The seriously injured had been

removed to hospitals and all bodies had been recovered. The job of cleaning up the debris began almost immediately. Most of this work was done by Negro prisoners from the state penitentiary. The townspeople's acceptance of these Negro workers, in spite of prevailing racial attitudes, provides another illustration of the breakdown of usual social norms in an emergency. The prisoners were quartered and fed in the gymnasium of the white high school. They worked all over the residential area of the town. As trusties, they were free to visit the Negro community when not working. Yet the white people of Antlers voiced no objection to the presence of this unusual group in their midst or to their freedom. They were grateful for their assistance.

During the Period of Rehabilitation administrative conflict between some local leaders and professional Red Cross workers from outside the town developed. Certain local leaders who had not functioned at all during the emergency period attempted to take charge of all rehabilitation activities and override standard Red Cross policies and procedures. As members of the local committee reviewing rehabilitation grants recommended by the Red Cross, they objected to both the case-work methods of the organization and the "need" basis of making awards. Other local people were influenced by these leaders' open criticism of the Red Cross. The rehabilitation workers took a firm stand in support of their standard policies and practices, however, and by their work convinced many of their validity.

Not even a disaster of this magnitude was sufficient to evoke more forceful leadership or to stimulate the development of a disaster organization in Antlers. No disaster plan was devised after the catastrophe, and only a few citizens even constructed storm cellars. The townspeople say they are "tornado conscious," but there is no visible evidence that they really are. The town was no better-prepared to cope with a disaster in 1950, the time of this investigation, than it had been in 1945. One possible explanation is that advanced by some people acquainted with this section of Oklahoma: that it is simply one of the poorest, least progressive, hardest-to-change sections of the state.

HOLDENVILLE: 28 APRIL 1950

Holdenville is a town of about the same size as Woodward, having a population of 6,632 in 1940.[20] It is a service center

[20] Sixteenth Census, op. cit., Table 30, p 130.

for a prosperous livestock area and the oil fields which surround it. The tornado which swept through parts of the residential district at 1905 hours, 28 April 1950, did less damage than did the Woodward and Antlers tornadoes. But five people were killed, 28 injured badly enough to require hospitalization, and 215 houses were damaged or destroyed.[21] A main power line was blown down outside of Holdenville, leaving the town in darkness for several hours. Fortunately, no fires were started.

At the time of the disaster the town had a mayor and city commission form of government, but the mayor was out of town. The police department consisted of seven officers, and the fire department had four full-time members and seven volunteers. The town was unusually well-endowed with medical facilities, having two hospitals. Some of the people in Holdenville were tornado-conscious, especially the paid-secretary of the county Red Cross chapter. There had been two tornadoes in the county in the past. For many years the Red Cross had sponsored an annual "disaster meeting" in the county. Just two weeks before the tornado struck, the county Red Cross chapter had met with city and county officials to discuss a disaster plan. Immediately after this meeting organization of various disaster committees had started. The medical, shelter, inquiry and registration, and canteen committees had already organized and developed some plans. Rescue and transportation committees existed but had no plans. Most of the people of Holdenville, however, knew nothing about this organization.

As in the other tornado towns, the Period of Threat was brief but some people had time to retreat to storm cellars. The impact was followed by a spontaneous formation of small rescue groups in the Zone of Destruction, an efficient checking for missing persons in small neighborhood groups, and a rush towards the path of the tornado by people from the Zone of Light Damage. There was also the failure of some people quite near its path to realize that a disaster had befallen the town. For example, two members of the newly-formed rescue committee who lived only one and a half blocks away did not realize what had happened until they heard sirens screaming and went outside to investigate.

By a happy coincidence that part of the path in which destruction was most extensive was only two blocks removed from the

[21] Holdenville Daily News, Holdenville, Oklahoma, 30 April 1950.

National Guard armory. One of the two local National Guard companies was making preparations for some week-end training, and a group of Guardsmen, in uniform, were at the armory. Some of the small groups which rushed to the damaged area for rescue work were teams of these soldiers. Guardsmen drove away in their trucks to pick up other members of the company, anticipating that they would be needed.

The fire chief had no family to worry about and went at once to the Zone of Destruction, arriving there about 10 minutes after the storm had passed. He had only three firemen available to help him, but when he reached the area he asked for assistance from the National Guardsmen whom he found there. His greatest concern was that fires might start from gas that was issuing from broken outlets. He immediately organized a patrol of Guardsmen and firemen to caution people against striking matches. Then he set up a public address system which was available and attempted to organize a systematic search of the part of the damaged area near the armory. He admitted, however, that his efforts were not very successful. The line of searchers whom he directed to comb the area soon broke up into small groups searching through the wreckage in a random fashion. Fortunately, the injured were easy to locate and by 0100, 29 April, the last bodies had been discovered, although these victims had been blown some 300 yards from their homes.

The police chief acted less quickly than the fire chief, but he did function in time to prevent serious traffic congestion. He was returning from a neighboring town when he heard the roar of the tornado. He went to his home to check on his family. Then he drove to the edge of town and set up roadblocks on all approach roads, using civilian volunteers. When he finally reported to the city hall he found that all the other members of the small force were out doing rescue work. Telephone communications were still intact, so he remained in his office to handle the multitude of calls that were beginning to pour in from outside of Holdenville.

The entire strength of the local National Guard contingent was mobilized within an hour after the tornado struck and the company officers took command. The Guardsmen completed the search for dead or injured persons, and then established an anti-looting guard over the entire Zone of Destruction. They soon discovered that looters were passing their lines under the pretense of being

residents of the area, so they began passing only people with written permits from the police chief.

The medical facilities were not strained by the disaster, but there was a threat that they might be hampered by the lack of electric power during the Period of Immediate Reaction, for about five hours after the time of impact. The problem was met in an entirely unexpected way. A doctor affiliated with one of the hospitals was a "ham" radio operator and owned an efficient portable generator. He brought the generator to the hospital immediately and found that it furnished ample power for the institution's needs. Also, the alert operator of a local welding shop owned a portable generator which he used in his work. Realizing that the hospitals might be without power, he hurried to the second one and installed his generator. It may be noted that the very important actions of these two men were taken spontaneously on their own initiative, and that provision for emergency power was not included in the original partial disaster plan.

It is difficult to ascertain just how effective the disaster organization was in this situation. Undoubtedly, much effective action was taken independently of this organization. The rescue committee, actually composed of members of the local American Legion post, did not function as a unit, but many of the members did rescue work in an individual capacity. An indication of the dangers of a disaster plan which is not suited to the needs of the specific situation is found in the actions of two of the members. Immediately after the tornado struck they rushed away from the Zone of Destruction to Red Cross headquarters in the courthouse. Finding none of the other members of the committee there, they waited for others to assemble and never participated in rescue work. Later during the night they did function as part of an impromptu transportation team.

The canteen committee functioned more efficiently, setting up two fixed canteens and operating one mobile one. They were slow in getting into action, however, and Salvation Army workers from a neighboring town were the first to get a canteen into operation, at the armory. Committees which were not required to go into action during the first few hours after impact functioned more effectively. For example, the registration and inquiry committee assembled at the Red Cross headquarters during the night and continued to function until data needed by rehabilitation workers

from Regional Headquarters had been assembled. The secretary of the Red Cross had devoted her energies on the night of the disaster to determining what the situation was and notifying the Regional Office. The local Red Cross organization was also ready to begin distributing emergency relief items the morning after the disaster.

It may be said that during the Periods of Emergency and Rehabilitation the local Red Cross organization functioned with a high degree of effectiveness, but during the Period of Immediate Reaction it was disorganized and ineffective. A large part of this ineffectiveness seems to have stemmed from the fact that, confronted with an actual disaster, many of the members did not know where to go except to the Red Cross office. And it happened that in this instance the Red Cross office was far removed from the Zone of Destruction, so that workers who assembled there were of little immediate value.

During the Period of Rehabilitation one administrative conflict arose between regional Red Cross representatives and local municipal officials. Immediately after the news of the storm spread over the state, cash contributions for the people of Holdenville began to be sent to the town. The day after the disaster an emergency finance committee was formed by local businessmen to manage these funds. While one member of this committee was authorizing the street commissioner to use this money to pay extra employees to help in cleaning up the streets, another member was turning the money over to the Red Cross. When the street commissioner was ready to pay his helpers, he was told that Red Cross funds could not be used for community rehabilitation. Tension mounted until a Red Cross representative agreed to return the money to the local committee. Even a minimum of advance planning to ascertain the purpose for which emergency funds are required, plus better understanding of the functions of the Red Cross by community leaders, would have prevented this tension. The conflict was a behind-the-scenes one and had little effect on popular attitudes toward the Red Cross.

At the time of this investigation, the local Red Cross chapter was devising a new disaster plan and organization. But knowledge of the plan still seemed to be confined almost exclusively to members of the Red Cross chapter. There was little indication that the majority of the people in the town would rely upon or fit into this plan in the event of another disaster.

There was one organization in Holdenville, however, which functioned as a unit during the disaster and still has a well-rehearsed plan for action in the event of another. This is the "ham" radio operators' club. During the 1950 emergency, members of this organization cooperated with the Red Cross and police in broadcasting names of dead, injured, and unharmed persons in response to inquiries from other places. They are now members of a nationwide emergency amateur radio net, and participate periodically in mock disaster exercises.

Whether it was because of the effectiveness of local action or the relatively small amount of damage caused by the tornado, Holdenville recovered quickly from its disaster. Indeed, the very night of the storm the local Red Cross secretary had to plead with an official in Oklahoma City not to send more doctors, as they were not needed. While the rushing of more than necessary aid to a stricken peacetime community may result only in needless confusion, in a military situation such waste of forces might be disastrous.

SASAKWA: 15 SEPTEMBER 1950

Although it could scarcely be called a disaster, the emergency which resulted in the village of Sasakwa as the result of a tornado was the only case investigated by methods of participant observation. The disaster research team reached this rural community of less than 1,000 people approximately four hours after the tornado struck. Due to the fact that the community consisted of only a crossroads business center and widely scattered residences, damage was light. Only five people were injured and none were killed. However, three significant features of this near-disaster were noted.

One was the immediate, unplanned, and informal mobilization of the people of this small, intimate settlement, for the rescue work that had to be done. The storm struck just as darkness was falling, and was followed by a torrential rain. Yet by the time state police officers arrived, a little over an hour later, even those residents living in outlying farms had been accounted for. An impromptu but very thorough check was made by local residents, despite the absence of any preconceived plan, formal organization or authoritative leadership. The small, primary-type group is not dependent upon such factors for effectiveness of action.

A second significant feature was the exaggeration of the magnitude of the near-disaster by outside news sources. After the people in the town at the time of the storm had satisfied themselves that they had luckily escaped a real disaster, reports were still being broadcast over the radio that the town had been almost wiped out, that several people had been killed, and that a whole troop of boy scouts on a camping trip near the town was still unaccounted for. It may be pointed out that in a military situation such exaggeration of the fate of one unit might prove disastrous to supporting and adjoining units.

A third aspect of emergency reorganization which had been present in all the disasters investigated but was observed at firsthand in Sasakwa was the functioning of telephone and power company emergency crews. While they receive little public notice, these trained professional "disaster fighters" are on the job soon after the impact of any peacetime, community disaster involving an interruption of normal services. (Coming usually from the peripheral zone outside the stricken town, these "disaster fighters" work as an organized force regardless of the state of community disorganization, and they concentrate on the job for which they have been trained. Their contribution to reorganization does not consist of saving lives by first-aid work or restoring order to a disorganized group; it consists of carrying out an assigned mission in spite of all obstacles. Yet the accomplishment of this mission is essential to the restoration of a community to a state of normalcy.)

In Sasakwa, these crews arrived about two and one-half hours after the storm and went to work immediately. Except for breaks of from ten minutes to half an hour, the men worked continuously until noon the following day. During the night they worked under conditions which were uncomfortable and hazardous. It was cold, windy, and there was spasmodic rain. Many of the poles they climbed were shaky. The night was very dark, and work at the top of the poles was done by the light of automobile spotlights. In the face of these difficulties, the "trouble-shooters" worked with untiring persistence. There was no "loafing," no holding back from an unpleasant job. Although a work supervisor was on hand, he did not drive the men to their work. His primary functions seemed to be coordinating their work and facilitating it in any way he could, such as procuring a supply of hot coffee for them. The motivation of such workers and the type of training they receive are worthy of further investigation.

REACTIONS COMMON TO TORNADO TOWNS

In the tornado disasters described in this report certain common socio-psychological reactions were found. One which differed notably from the pattern of behavior in Texas City was the fact that there was no panic flight from any of the towns themselves or from any of the areas in them. Also dissimilar from the pattern in Texas City was the absence of rumors of new threats in the tornado towns. Rumors in these towns were confined to exaggerations of the amount of damage and loss of life.

As in Texas City, informants in the tornado towns reported that instances of irrational, "hysterical" behavior were rare during the disasters. With almost monotonous regularity the survivors in the Zone of Destruction were described as appearing "stunned," "dazed," or "shocked." People who had actually engaged in rescue or medical work reported that screaming and frantic pleading for help were more likely to come from the very slightly injured than from the seriously injured. Other people described as likely to be "frantic, but not hysterical," were persons who could not find close relatives and feared for their safety. People who had accounted for their loved ones tended to be at least outwardly calm, even if the ones they had sought were found to be dead.

In the tornado towns, as in Texas City, a tendency for usual social norms to break down during the Period of Immediate Reaction was noted. This redefinition of the situation was manifest especially in a disregard for property values, an acceptance of death and bloodshed as a matter of course, and a lack of attention to the identity of fellow workers.

Finally, a highly significant feature of all the disasters studied was the rapid emergence of small, spontaneously formed, and informally structured groups to meet specific, localized problems, such as extricating an injured person from debris or finding a neighbor who was unaccounted for. These groups were not planned, nor were they organized by authoritative leaders. Rather, they were based on the physical proximity of the members, sometimes on previously existing primary group ties, and always on the demands of a common situation. They arose not only among rescue workers who, rushing in as individuals, met in the Zone of Destruction, but also among the survivors in the mostly badly ravaged parts of this zone.

HOLOCAUST: DORMITORY FIRE

The fire which destroyed a men's dormitory at the University of Oklahoma in the early morning hours of 3 December 1949 was not a community disaster, as were the ship explosions and the tornadoes. It involved a relatively small group of people and covered only a small territory. It is of particular interest for the purposes of this research, however, because of the similarity of the group to a military unit.

The dormitory was located on an inactivated Navy base used by the University of Oklahoma as part of its campus. Because the building had been used by the Navy for bachelor officers' quarters it was known to the students as "the BOQ." It was located in a relatively isolated spot, the only occupied structures nearby being a few single-family dwellings used by naval ROTC personnel and another dormitory, about fifty yards away, known as "Building 164." These buildings were about three miles from the town of Norman, Oklahoma, and the main campus of the University of Oklahoma.

The BOQ was a two-story frame building with five wings running perpendicular to a long dining and recreation section. It housed 349 men. Building 164 was a two-story, barracks-type, frame structure housing 47 men. Both buildings were over five years old. On the night of the fire, the wood in them was dry as the result of a long period without rain. The BOQ was completely consumed by the flames in the 65 minutes between 0245 hours and 0350 hours. Building 164 did not catch fire because it was thoroughly saturated by streams of water from fire hoses. The water damage made it uninhabitable, however.

The groups that occupied these two dormitories are of particular interest because they were made up of men of military age. Like combat soldiers, they were separated from their families and knew that the disaster would not directly affect their

loved ones. The structure of the groups was similar to the structure of military groups in that the basic small groups were male cliques. The authoritarian structure of military society was absent, however. Each dormitory had a resident head counsellor and assistant counsellors, but their authority was scarcely comparable to that of a military unit commander. In fact, the majority of the men who lived in the BOQ reported that they liked to live in the dormitory because of the relative freedom from University supervision which this isolated building provided. The counsellors were generally regarded as "good Joes."

The fire started, from still undetermined causes, on the second floor of the first, or southernmost, wing. It spread very rapidly through this section, and a strong north wind caused it to jump from wing to wing across the areaways separating them.

It is not known who first discovered the fire; almost all the residents of the BOQ were in their beds asleep when it started, at 0245 hours. None of the informants, including men from all five of the wings, reported hearing any sort of general alarm, such as the cry "Fire!" Instead, they said that they were awakened either by their roommates or by the noise of people running and talking in the corridors. The number of men who reported that they were either awakened by their roommates or that they awakened their roommates and sometimes the men in connecting rooms, indicates that the basic social structures, small groups, and the loyalties they engendered were of cardinal importance in the spreading of the alarm.

According to news accounts of the disaster, one of the three men who perished in the blaze did act in terms of the larger group, going from room to room awakening the occupants until he himself was trapped by the flames. The informants for this study, men who had actually been present in the dormitory, said, in effect, that they understood that this man had awakened many people, but none of them reported that they themselves had been awakened by him. To repeat, according to them it was the actions of many individuals in alerting their own clique-mates, and sometimes members of nearby cliques, which served to spread the alarm throughout the building. The data obtained in this investigation give no evidence of the emergence of general dormitory, or even wing, leadership within the burning building.

Some men, particularly those in the two wings nearest the point of origin of the fire, awakened to find the corridors blazing and their rooms filled with smoke. Such men thought only of saving their own lives and the lives of men in their immediate vicinity, usually roommates or suitemates. They gave no thought to personal possessions, even money and valuable jewelry. Furthermore, in the face of a new, dangerous situation, ordinary considerations of lesser but equally real dangers, such as that of jumping from a high place, disappeared. Many men escaped from the burning building by jumping from an escape ledge which extended around the building just below the second story windows. Many of the injuries received were from the effects of this jump rather than from the fire. An illustration of the reaction of men in this situation is found in the actions of a man who, so far as he can remember, dived head-first from this ledge. He said:

> I'm not sure what awakened me -- I think it was my roommate but he had already gone from the room when I got out of bed. The room was hot and full of smoke, and I could see a red glow through the door. I saw I couldn't go out that way, so I ran into the bathroom and closed the door. It felt cool in there. I looked in the adjoining room to see if the fellows who lived there and shared our bath were gone. They were. Then I opened the little bathroom window quicker than I ever had in my life. Just as soon as I got out I jumped. That's all I remember.

Further away from the point of origin, men had more warning. Some awakened to find that the fire was already in their wing, but that their rooms were not threatened for the moment. Before leaving the building, usually through the windows, they took time to put on some clothes and to throw their most valuable belongings out the window. They abandoned most of their possessions to the flames, however.

Still other men awakened before the fire had reached the wing in which they lived. In spite of the fact that they knew the building was burning, they removed most of their possessions, sometimes making two or three trips in and out of the building. One of these men described his reactions as follows:

> The fellows living across the hall told me and my roommate about the fire -- one came in our room and

waked us up. Then my roommate went in the next room to wake up the fellows in there, and I went down the hall to see that a good friend of mine knew about it.

The fire wasn't in our wing, and at first I didn't even think about the place's burning up. In a minute or two I decided maybe I'd better get my things out just in case. I didn't even go towards the fire to try to find out how bad it was -- I figured somebody was probably putting it out.

I made three trips out of the building. The first things I thought of taking out were the clothes I was planning to wear to a dance the next night! I was pretty calm on the first two trips -- I didn't think of the possible danger of going back into the building, and I guess I took it pretty slow. On the last trip the fire was getting pretty close and I did one thing that was kind of crazy. I threw my footlocker out the window, and then I threw my alarm clock after it -- I was trying to save it by throwing it out the window!

It looked to me like all the fellows that lived in that same wing with me were doing about the same thing I was -- each one taking his own stuff out. Sometimes you'd see a couple of fellows helping each other some.

This statement, and others like it, makes it even more evident that no general organization or over-all leadership developed in the BOQ during the fire. The men reacted as individuals or as members of small groups, in terms of the immediate situation confronting them. Those in the places of greatest danger took what seemed to be appropriate action to save themselves and the people closest to them. Those in places of lesser immediate danger reacted in terms of their own situations. While it is unlikely that the men in the third, fourth, and fifth wings could have taken any effective action to prevent the spread of the fire, at least some of them did not even realize that the whole building was threatened until after all hope of fighting the fire had passed.

All but three of the men in the BOQ escaped, although some were burned before getting out or were injured in escaping. Once outside, there was little that they could do but collect their belongings, move them further away from the building, and watch the fire. Some ran through the crowd looking for friends they were not sure had escaped. Some bemoaned the loss of their possessions. One had lost his almost-completed master's thesis.

Another complained only of the loss of his neckties. His complaint sounded ridiculous, but collecting fine ties was a hobby with this student and they represented an investment of over a hundred dollars. In short, the scene was one of great confusion. The most frequent answer of informants to the question, "Do you think other people were acting rationally after they got out of the dormitory?" was "No!" But there is evidence that the panic was more apparent than real, for to the question, "Do you think your own actions were rational and logical?" every informant answered "Yes!"

Only two instances of organization and leadership, other than the informal type found in cliques, emerged outside the BOQ. The dormitory counsellors, seeing roles for themselves in the situation, began immediately to attempt to take a roll of the survivors, under the direction of the head counsellor. In the other instance, some policemen recruited a group of survivors to push cars, standing in a parking lot near the burning building, farther away from the fire. Their suggestion elicited a quick response from the men who had, only a few minutes before, been in mortal danger.

Even after the fire was over, an emergency still existed. Many of the men from the BOQ had lost everything but what clothes they were wearing, and those who had saved their possessions had nowhere to put them. University officials opened a vacant barracks and permitted the men to store their belongings there for the remainder of the night. Most of the men went to friends in other dormitories, to clean up and borrow clothes if necessary.

Early the next day University officials evacuated the women from a girls' dormitory and announced that all men from the BOQ and Building 164 could move into it. They also broadcast a request for the registration of all survivors. At the same time, the Red Cross started relief activities by issuing each survivor a check for ten dollars to take care of his most urgent needs.

Rehabilitation -- restoring the survivors to a physical, psychological, and financial state in which they could continue their studies -- began the day after the fire, and is the most significant aspect of this disaster. It is of particular significance because it was a case of group rehabilitation. Almost the entire group of men from the BOQ and Building 164 moved into the newly opened dormitory, "the Residential Halls." Most of them obtained rooms with their former roommates, and the same counsellors continued

to se ve. The group which had been in the disaster was reconstituted almost exactly as it had been before. More important, living together as they did, the men were able to make comparisons of the amount of aid each received, and they reacted as a group, not as so many scattered individuals, to rehabilitation efforts.

On the day after the disaster, the BOQ survivors had no definite expectations as to where they would get help. Those who had suffered the most severe losses knew that they would need help, but there were other men who had lost very little and felt no great deprivation. There was some feeling among the men that the University administration had a certain responsibility for what had happened. Some boys felt that greater precautions against fire might have been taken, but no real hostility to the administration had developed. More important, no group expectations or definitions as to who should recoup the boys' losses had developed.

Without any prompting from the men themselves, not one, but many, sources of aid developed. The first was the Red Cross, which began issuing emergency funds less than 17 hours after the fire. Later, after investigators had ascertained the extent of each boy's losses, clothing orders for $150 were issued to men who had lost most or all of their clothes. The men were not surprised at receiving aid from this source, since they knew the Red Cross as a disaster relief and rehabilitation organization, but they were grateful for the aid. They felt also that it was wisely and fairly distributed.

By Saturday night, almost 24 hours after the fire, about half a dozen organizations in Norman and Oklahoma City were collecting funds to be donated to "the BOQ boys." The first and most prominent effort was that of a student committee which took up collections at a basketball game and several other student gatherings Saturday night. Eventually, funds collected by other organizations were turned into this one, and the combined fund was administered and distributed by representatives of the University administration.

These collections were something not expected by the men. They did not object to them, although some said they didn't like the idea of being the objects of charity. One BOQ survivor even contributed to one of these collections! But as the funds were distributed, the attitude of mere thankfulness changed to an attitude of "I want my share," even among those who had suffered

almost inconsequential losses. Although they had not asked for it, the men realized that a fund now existed which had been collected in the name of their needs. As successive distributions of the fund were made, they began to feel that some were receiving more aid than they actually needed. A group norm arose which approved accepting whatever one could get. This was accompanied by an increase in hostility towards the University administration because of the way the fund was being distributed and the fact that none of the money had come from University funds.

The first distribution of aid from the student fund was in the form of emergency grants to individuals who needed certain equipment immediately in order to continue with their school work. The second distribution, in which funds were given to all who had incurred losses, was made on the basis of need, ascertained by questionnaire and interview methods. As has been the case in all rehabilitation programs studied, some individuals disagreed with the judgment of the committee awarding the grants and the rumor circulated that some men were "making money" as a result of the disaster. Some students actually did attempt to conceal the fact that their losses were partially covered by family insurance policies; and a few such attempts may have been successful.

Another source of dissatisfaction with these grants was the fact that debts to the University, such as medical costs resulting from the fire, and unpaid board and room bills, were considered as part of the "needs" on which grants were based. As a result, a student with unpaid obligations to the University would receive more money than a debt-free student who might have suffered equal property loss, even though he had to pay the extra money to the University immediately. This created the impression that aid was being given on a "more-than-need" basis, and also aroused hostility towards the administration. It was generally felt that, since the university was at least indirectly responsible for the fire, such debts should have been cancelled.

After all individual losses seemed to have been covered, money still remained in the fund. Both the fund administrators and the students themselves reported that by the time the final distribution was made, with the remaining sum being divided equally among those who had lived in the BOQ, the men were impatient and demanded to "get their money."

Another aspect of rehabilitation was the re-establishment of the normal routine of university life among the survivors. By the time class-work was resumed, on the Monday morning following the fire, all except those who were hospitalized were physically able to attend classes. But by this time it had become apparent to the men that as a group, without regard to the differential effects of the disaster on individuals, they had become the objects of special consideration. Most of them reported that they did not attend class on Monday because they knew that they were not expected to. One had even gone to class Saturday morning, but had been told by the professor that he did not have to stay. Some missed classes for a whole week. And when these students did return to classes regularly, many of their professors told them that if their grades declined during the remainder of the semester the low grades would not be counted. While some did report that the disaster upset them so that they "could not concentrate on anything for the rest of the semester," it is impossible to separate the actual psychological effects of the experience itself and the effects of the special treatment which the survivors found they could get.

In general, the survivors of the BOQ fire, as a group, developed attitudes which were the reflection of the attitudes of other people towards them. They came to realize that they were a special group in the student body, regarded by other people as deserving of unusual consideration and not to be expected, for the time being, to meet usual standards. The great amount of publicity which the disaster and their plight received, together with the well-intentioned efforts at rehabilitation, brought this fact home to them. So also did the sympathetic label, "the BOQ boys," which became standard among the university students and the people of Norman.

These factors, combined with their own constant discussion of the fire, its origin, and what various men did, made it impossible for them to forget about the disaster and return to a normal routine and state of mind. One student said he wasn't able to "settle down" until he moved away from the group in the Residential Halls at the beginning of the next semester. Others reported that the beginning of a new semester and the entrance into the dormitory of men who had not been in the fire also helped to make the recent disaster recede from its important place in their minds.

There were other psychological effects which lasted longer. These were the results of private, individual experiences and did

not depend upon group reinforcement for their persistence. They occurred chiefly among men who awakened to find themselves in great immediate danger from the fire. There were two sensory reactions which predominated and were reported as lasting as long as six months and sometimes even longer after the fire. One was a feeling of uneasiness at the sight of smoke or fire. The other was the experiencing of terror upon being awakened suddenly by a noise.

Finally, an important psychological effect of the disaster was the creation of a much stronger in-group feeling among the men who had lived in the BOQ than had existed before the fire. Constant discussion of the common experience by the men themselves, and the focussing of outside attention upon them as a social unit, were reflected in the development of a strong in-group attitude. Almost a year later this feeling still persisted among the "BOQ boys" still living in the Residential Halls. They themselves were not as conscious of its persistence as were students living in this dormitory who were not veterans of the fire. These "outsiders" described them as "a pretty clannish bunch," who "stuck together," still talked a lot about the fire, and constituted a definite subgroup in the total dormitory population.

INDIVIDUAL REACTIONS TO THREAT AND DISASTER

In all the disasters studied, marked inconsistencies in reactions to threat and to actual disaster have been found. Before the explosion of the "Grandcamp" for example, few people were alarmed by the fact that a ship was burning in their harbor. But after the explosion, the burning "Highflyer" was the source of great alarm, and people were frightened even by imaginary threats. Yet there were still a few people who would not leave the dock area even when warned that the ship was about to blow up. In tornado towns, some people recognized the roar of a tornado for what it was and sought safety in cellars; others heard the same sound and went calmly about their business, thinking they heard a freight train. People who had given no thought to the possibility of a tornado before disaster struck their town were later frightened by a dark cloud, a strong wind, or an unusual amount of static on the radio. Some men who had been through the dormitory fire found that afterwards a noise in the night would throw them into a state of alarm.

It is evident that it is not merely the objective signs of threat that determine individual reactions. Psychological factors in the person who perceives and reacts to these signs are equally important in determining how he will react to threat and whether he will perceive a threat at all. In this study, the psychological factors that have been found to be important are the person's motivations, his past experiences, and his conception of what constitutes a "normal" situation.

MOTIVATION AND REACTION TO THREAT

Even when a person is aware of the existence of a threat to his safety, his motivations may lead him to act in a manner that in no way reduces his exposure to danger. One of the strongest motivations leading to such reactions was concern for relatives.

This is clearly illustrated in the case of the father in Woodward who recognized the indications of an impending tornado but dashed into the street in search of his children. In Texas City, differences in motivation seemed to have been the determining factor in the difference in reaction of two Negro preachers who were together when the "Grandcamp" blew up. One was a local man, and his family lived in the Negro district; the other was a visiting evangelist, and his family was safe in another town. After the explosion both were terror-stricken and started to flee the city. The local man insisted, however, on going back for his family. The evangelist refused to wait for his friend, and left him afoot to find his family.

Concern for personal property in some cases caused a disregard of threat and danger. While property of all kinds was of little importance to the people in the Zone of Destruction in Texas City, some merchants in the Zone of Light Damage disregarded rumors of further danger until they had boarded up their damaged stores. A Negro merchant who stayed in the Negro district after most of the other residents had fled expressed, in his statements, the effect of this type of motivation:

> People all around here was leaving town as fast as they could. I just didn't feel like leaving -- I was going to stay with my store. It's all the property I had, and I figured I might get a little insurance on it anyhow. My family did leave, but that store kept me here.

There were, of course, some people who were motivated by a sense of duty. This fact is particularly evident in the case of the few people who did not leave the dock area in Texas City after a definite evacuation order had been given. Among those who stayed and were injured were a few police officers, the man in charge of the evacuation, and a Salvation Army worker.

The fact that because of such motivations some people react to threat and actual danger in what appears to be a calm, courageous manner does not mean that their actions are necessarily wise, from the standpoint of either self-interest or community service. At times, flight may be the best course of action for all. This was the case shortly before the explosion of the "Grandcamp". But such behavior is significant because it indicates that community reaction to threat and disaster cannot be understood merely in

a framework of homogeneous, mass reaction. It also indicates that even in the midst of extensive panic (such as existed in the Negro section) there are some elements of stability. Furthermore, neither rumors of danger nor orders to seek safety coerce a uniform response from the many people who are exposed to them. These stimuli are mediated by individual psychological factors, and the behavioral reaction of the individual is a product of the two. In a military situation, the motivation of the soldier must be understood if accurate predictions of reactions to disaster are to be made.

THE EFFECTS OF PAST EXPERIENCE

Past experience in disasters affects not only the individual's reaction to threat and danger, but also his perception of these objective conditions. In Texas City, before the first explosion, many people did not perceive a threat in the burning ship because they had watched many ships burn without disastrous consequences. Even the men who knew that it was ammonium nitrate that was burning were not alert to any threat, because they had had no experience with the chemical and did not know of other cases in which it had exploded. After the "Grandcamp" had blown, however, the same stimuli which had indicated no threat a few hours previously were perceived as signs of additional impending disaster. The burning "Highflyer," and other ships that caught fire several weeks after the disaster, created alarm in Texas City. Ammonium nitrate smoldering in the wreckage of warehouses gave rise to rumors of new threats to the town.

In the tornado towns, storm clouds that had once been scarcely noticed by the people later caused feelings of uneasiness and sometimes flight to cellars. One girl from Antlers reported that just before the tornado demolished her house she had been trying to get a news report on the radio, but that heavy static made reception bad. Five years after the disaster she said that an unusual amount of static on the radio still gave her an "uneasy" feeling. Men who have lived in the BOQ and awakened to find the dormitory in flames reported that, for months afterwards, to be awakened suddenly by a noise in the night gave them a feeling of fright.

The majority of the people in tornado towns who said that they knew that a tornado was coming and took refuge in cellars were

people who had been in tornadoes before. On the basis of their past experiences, they interpreted the objective stimuli correctly and perceived them as signs of threat. But the behavior of people subsequent to experiencing the disasters described here indicates that this very realistic sort of training does not insure accurate identification of actual, as distinguished from imaginary, threat. People have become alarmed and gone to storm cellars many times when there was no tornado.

The question that is raised here is: Can individuals be trained to recognize signs of impending disaster and differentiate them from similar stimuli which do not signify the imminence of disaster? The answer to this question would be of especial importance for military situations. It is desirable that soldiers be able to recognize signs of danger, but it would be disastrous for them to be subject to frequent, unwarranted alarms. It is believed that the answer to this question can be found only by experimental study of the effects of training on recognition of real signs of threat and of pseudo-signs.

During a period of threat, and after disaster actually occurs, past experience, including training, may be important in affecting individual behavior. Combat veterans invariably claimed that their war experiences gave them feelings of confidence and assurance in the midst of peacetime disasters. A retired Army officer in Texas City declared, "When I heard that explosion, I was back in the Army again in a flash. I threw myself flat on the floor to take cover." Another veteran, hearing warnings of a second ship explosion, constructed a crude "bomb shelter" out of mattresses and went on calmly about his work in the post office. When missiles from the "Highflyer" began to fall on the city, he was already in his shelter. The speed with which police officers almost automatically threw up road blocks around disaster areas was a reflection of past experience and training in disaster work.

In psychological terms, the person who has experienced one disaster finds the element of unexpectedness reduced for him when he is confronted with another disaster. He at least has some idea as to what may happen next, and he has some conception of what to do about it. An important question for further research is: To what extent can training -- vicarious experience -- be substituted for actual experience in preparing the individual to cope with disaster problems?

THE EFFECTS OF THE CONCEPTION OF WHAT IS NORMAL

Closely related to past experience as a factor affecting reaction to threat and disaster is the individual's conception of what is the normal situation. Superficially it would seem that danger is, per se, "abnormal." Closer examination of the facts shows, however, that what in other times or in other places may be regarded as dangerous or horrible may become normal, accepted parts of some situations. The important result is that persons in a situation, where danger or horror is chronic, act with a calmness which to other persons, not in that situation, seems amazing. This is best illustrated perhaps in "dangerous" occupations in which men work calmly and nonchalantly in the presence of threats which, to the inexperienced, would be terrifying.

The effects of the conception of the normal situation on reaction to threat were graphically illustrated in Texas City. Many people, in explaining their lack of alarm when the "Grandcamp" was burning, explained that, in a port handling so many petroleum products, waterfront and refinery fires were frequent and not at all unexpected. Some declared that, had it not been for the peculiar orange color of the smoke, the ship fire would have attracted even less attention in Texas City than it did. Similarly, to the firemen and stevedores fighting the fire from shipside, their fatal task was merely part of the day's work.

When disaster does occur, a new definition of the "normal" quickly emerges. Expectations which were appropriate to the previously existing situation lose their validity for the people involved. In Texas City, a ship fire ceased to be normal after the "Grandcamp" had blown up. In this and other disasters, sights which would ordinarily evoke reactions of terror or revulsion were viewed quite calmly by people who realized that the entire situation was not an ordinary one. This fact was especially evident in reactions to death and bloodshed. Like the fireman in Antlers who "snaked" his hose around the bodies of victims, many people reported that it was not until after the emergency situation had passed that they felt revulsion at what they had done and seen. Some people described this behavior as merely an individual process of "becoming accustomed to it," but a few perceived the effect

of the whole disaster situation upon individual reactions. One man expressed his feelings in these words:

> I've felt a lot worse about seeing one person killed or all cut up in an automobile accident than I did about seeing so many dead at once. You can feel sorry for one person, and get upset about what's happened, but when there are so many you don't pay so much attention to it.

An official of the Texas Department of Public Safety who acted as public relations officer for that organization during the Texas City disaster expressed this reaction even more lucidly:

> I have seen a lot of dead people. There was nothing ghastly or sickening about the bodies and pieces of bodies that were strewn over the ground, trapped under freight cars, floating in the water and oil. The sensation was one of being suspended in space and time.22/

In a disaster situation, people also derive new definitions of what they can and must do. Every disaster produces stories of individuals who work for incredibly long periods of time without rest. Informants who had performed such feats were asked, "What do you think kept you going?" The most common answer was to the effect, "There was so much that had to be done and so many other people were working that I felt I had to keep on working." Both the demands of a new situation and a new level of group expectations enabled, and even forced, individuals to "forget" their usual standards of how much they could do. Just as workers striving to earn a bonus for increased production may gradually raise their rate of production to a level which they once would have declared impossible, so in a disaster people realize undreamed of capabilities in the face of the demands of a new situation. Since a disaster situation is necessarily a situation in which new standards and expectations arise, predictions of what people will do in a disaster cannot be based solely on data obtained from "normal" situations.

REACTION TO THREAT: A CASE STUDY

The combined effects of the three factors of motivation, past experience, and the definition of what is normal on reaction to

22/International News Service wire release, 18 April 1947.

threat are seen clearly in the community of Picher, Oklahoma, a town in which threat is chronic. Under a four-block area in the business district, owned by a zinc-mining company, is a cavern excavated in mining operations. The roof of this cavern is supported by concrete columns. In the spring of 1950 the mining company found that these columns were disintegrating and ordered the occupants of business buildings and residences in the area to evacuate. The urgency of the need for evacuation was impressed on the officials of the company by the fact that a similar area outside of Picher had actually sunk about 240 feet. The company had not, however, attempted to enforce removal orders.

At the time the warning was issued there were about a dozen businesses located in the threatened area, and approximately 25 people living there. Despite the warning of the company engineers and confirmation of the existence of danger by a state mine inspector, the area had still not been completely evacuated six months after the order to vacate had been issued. A bank, a theater, and two business offices were moved, but some of the business people and many of the residents remained in the area.

Interviews with people who remained in the area in apparent defiance of a very real threat indicated that motivation was an important factor in this disregard of danger. One of the chief reasons that they did not leave was that they had investments in property there. Furthermore, they regarded the danger area as "their place" and felt that they would have nowhere to go if they left. One woman, for example, was the owner of a drugstore which had been founded at that spot by her father 28 years before; she had lived there most of her life, and refused to move.

The motives of economic interest and attachment to a locality did not operate alone, however, in determining these people's reaction to threat. Past experience had affected their perception of the danger and led them to believe that it was not so great as they had been told. Mining had been going on in the area since 1914, and for years the people had been warned of the likelihood of the surface sinking. Since disregard of these previous warnings had not proved disastrous, the residents of the area did not regard the current situation as constituting a real threat. In fact, they felt that the mining company officials were unduly alarmed and were resentful because they felt that their warning had injured business in the area.

Finally, it is evident that living on the dangerously unstable roof of a mine had become part of the normal existence of these people. Rumblings due to blasting in the mines almost every afternoon had become a familiar part of their lives, as had periodic warnings that they were living in an area which might suddenly sink. Hence, when the company issued a new warning, even one accompanied by an order to evacuate, they did not perceive this as a threat but as a normal, familiar event. Tney even made jokes about it. The day following the issuing of the evacuation order, one man brought a parachute to a Lions Club meeting!

In the light of this brief case study, it may be reiterated that stimuli which may signify the existence of threat are not merely responded to, but are interpreted and reacted to in terms of the individual's motivations, his past experience, and the situation to which he is accustomed. Training for disaster must include, therefore, not only the transmission of knowledge necessary to the recognition of signs of threat, but also the development of attitudes and habits that will insure the proper evaluation of, and reaction to, these signs.

It is conceivable that in a combat zone, for example, the soldier thoroughly versed in the recognition of signs of threat might become contemptuous of the danger these signs symbolized because of their normality in the combat situation, or because of fortunate escapes from danger in the past. An Air Force combat veteran, a graduate psychology student at the University of Oklahoma, told how this very situation developed among ground crewmen at an often-bombed air base in England during World War II. Men who, at first, ran for bomb-shelters at the sound of air raid warnings and the sound of enemy bombers overhead, later stayed in their beds reading or stood in the open to watch "the show," after the earlier raids had produced no casualties and nightly bombings had become familiar occurrences.

THE IMPORTANCE OF ROLES IN REACTION TO DISASTER

In the disorganization and absence of familiar reference points that follow the impact of a disaster, a fourth factor helping to restructure the situation for the individual is the possession of a role appropriate to the new and unfamiliar situation. Evidence from the various disasters studied indicates that the person who

conceives of himself as being especially qualified to do some job in the new situation tends to act calmly and quickly in spite of the confusion that prevails about him. The role which such a person sees for himself in the disaster situation is not necessarily one which he is accustomed to playing in everyday life, nor need it be one which he has been arbitrarily assigned in some disaster plan. It is one, however, for which he feels himself prepared, one in which he feels that he will be doing something, no matter how small.

One of the clearest examples of the effects of a role on reaction to disaster was found in the actions of doctors. For them there was no hesitation and no confusion about what to do when disaster struck; they hurried to their hospitals. A similar reaction was found in the case of a minister in Texas City, who said:

> After I heard the explosion my first impulse was to go down to the docks and try to help there. But when I saw two or three women whom I knew had husbands down there, I realized that my job was with the families -- not doing rescue work. I had a job that I was peculiarly suited for, prepared for, and I felt that I should do that.

It is to be expected that such people as doctors, ministers, police officers, firemen, and public utilities employees would, because of the nature of their regular occupations, see roles for themselves to play in a disaster. There are many other people, however, whose usual occupational roles would give no indication as to what they should do. But in some cases these people perceived that they had other talents which would prepare them for a role in the disaster situation. Such a man was a machinist in Texas City who stated:

> As soon as I had gotten out of the machine shop and realized that there had been a terrible explosion, I went right over to the first aid station here at the plant. You see, I'd had first aid training and I thought that I could be of some use there. I asked if I could help and they said, "You sure can." The nurse in charge told me to gather up some supplies, take a truck, and go down to the docks.

In many instances women who had nurse's-aid training reported immediately to hospitals where they believed that they

would be needed. As was reported previously, in Woodward some veterans of the Army Medical Corps recognized that they could perform a valuable function as assistants at the hospital. The welder in Holdenville who realized that his portable generator could be used to provide badly needed lights at a hospital acted with dispatch to fulfill an essential need. Auxiliary policemen in Texas City, reporting to the city hall not because of any plan or any appeal for help but because they knew of a job they could do, provided the police chief with his first group of workers. Out of such an unplanned combination of individual actions grows the reorganization of a group disorganized by disaster.

Conversely, much confusion stems from the presence of people who do not know what to do and who can see no role for themselves in the situation. In Texas City, many of the people who left the town in response to false evacuation warnings were ones who said, "I didn't see anything I could do here, so I left." A man in Woodward said of the disaster there, "One of the things that worried me most was that so many people didn't know how to take hold and do something. They didn't know what to do."

In view of the disorganization and the breakdown of means of communication which follow immediately upon the impact of disaster, a few leaders cannot be expected to suggest to large numbers of people what to do. It may be suggested, however, that one aspect of an effective disaster plan should be the designation of roles, no matter how insignificant, for as many members of the group as is possible. In such a way the chances that essential tasks would be performed would be increased and a stabilizing factor would be provided for the many individuals faced with an unfamiliar and unstructured situation.

CIVILIAN REACTIONS TO DISASTER

The disasters described here happened to civilian groups in peacetime. Those affected were non-military personnel of all ages, of both sexes, and of different racial and cultural backgrounds, all engaged in various peacetime pursuits at the time disaster struck. These people were functioning under a system of authority different from that of military unit and, in all but one disaster, were parts of primary groups, families, which were present in the disaster area. Yet they shared with any other disaster-stricken group, either civilian or military, the experience of being confronted with a terrible and unexpected crisis demanding new and unpracticed reactions. Therefore, conclusions formulated on the basis of these findings, and on the findings of other students of catastrophe, may be used as a starting point for the prediction of the behavior of soldiers in military disasters. But before such predictions are undertaken, findings as to the reactions of civilians to various aspects, and in various stages, of disaster-induced crises will be summarized.

REACTION TO THREAT

Not all disasters are preceded by a period of threat; that is, by a warning which is subjectively real to the members of the group threatened. This does not mean that signs of danger may not be present. But the existence of threat must be realistically defined in terms of awareness of real or imagined danger. As Richard LaPiere has said:

> No circumstance, however unusual, is a crisis unless it is so defined by human beings; that is, if the circumstance is to be a crisis for them, the individuals involved

must either be aware of the danger which is actually present or else must believe that danger is present.[23]

An obvious prerequisite to the existence of such a socially defined crisis is the possession by the people of sufficient technical knowledge to recognize these signs as warning signals. LaPiere adds:

> The more knowledge a people possess regarding natural and social phenomena, the more likely the social definition of crises will be in terms of actual rather than of imagined danger . . . Moreover, the more knowledge a people possess, the more readily actual danger will be recognized as a crisis.[24]

In Texas City, more knowledge of the explosive potentialities of ammonium nitrate, and, in the tornado towns, more exact methods of weather prediction, would have resulted in earlier definitions of crisis and might have made possible greater measures of prevention or preparedness.

Even assuming the possession of great knowledge, however, there are subjective factors which determine whether a feeling of threat will be aroused among the people who see, hear, or are told of, these warning signs. Perception, or, more properly, cognition, does not operate alone. Sherif, reviewing the work of psychologists who have studied such factors as perception and motivation, sums up their findings in the principle:

> All in all, cognition and motivation and action are not discrete functions operating in separate compartments. They are functionally inseparably interrelated in the psychological product of any given moment.[25]

In the disasters studied, the factors of motivation, individual past experience, and collective definition of what was normal to the situation all affected both awareness of danger and reaction to it.

23/ Richard T. LaPiere, Collective Behavior (1st ed.) (New York: McGraw-Hill Book Co., Inc., 1938), p 436.

24/ Ibid.

25/ Op. cit., p 46.

It was found that the individual's motives might, in combination with other subjective factors, lead him to be unaware of the existence of danger or, if he were aware of it, to expose himself deliberately to it. In Picher, people who did not want to give up their property insisted, in spite of warnings, that the danger in the spring of 1950 was no greater than it had been at any other time. Rescue workers in other disasters, and men who went back into the BOQ to remove belongings, were asked if they were not afraid. Many replied, "I didn't even think about the danger." Other people who were fully aware of the risks they faced, dared to expose themselves because of "a job" they felt had to be done, or because of concern for loved ones.

Field investigators for this project experienced changes in perception and in reaction to danger because of their research interest. They became attentive to possible indications of the approach of a tornado until friends accused them of "hoping for one!" When the Sasakwa tornado occurred, two members of the team forded a flooded stream which, the next day, they were told had been impassable at the time.

Whether a person recognizes signs of danger as such depends to a large extent upon whether he has witnessed a similar cycle of warning, followed by disaster, before. If the warning signs have not, for some reason, been followed by disaster when witnessed in the past, the person may not become alarmed by them. By the same token, people who have seen these signs followed by catastrophe are more likely to be alerted. A farmer on the outskirts of Holdenville went to his storm cellar because he saw the chickens going to roost before sundown on the day of the tornado, and knew that they usually did this before a bad storm. Conversely, after experiencing a disaster any of the conditions preceding it are, if repeated, likely to arouse a feeling of threat, as in the case of the girl who felt uneasy because of radio static, or the students who were terrified at being awakened by a noise in the night. LaPiere says of this reaction:

> Following a spectacular crisis, however, there is a tendency for people to define as a crisis anything which may be vaguely related to that kind of crisis. For some years after the Iroquois Theater fire, for example, all theater audiences were inclined to be panicky. The slightest incident might set people fighting for the doors. Smoking on the stage during the course of a performance

became inexpedient, for the smoke of an actor's cigar might set someone who could not forget the story of the Iroquois disaster to shouting "Fire!"[26]

Past experience in disasters may also serve as a type of training, giving the individual some knowledge of what sort of action is appropriate in the crisis. Possession of this knowledge serves the additional psychological function of reducing the uncertainty of the situation and giving the possessor some feeling of assurance, enabling him to function efficiently. This was best illustrated in the case of the post office employee in Texas City who did not let fear of a second explosion interfere with his work because of confidence in his improvised "bomb-shelter."

In some situations, danger becomes chronic, although disasters may not materialize for some time. In this case signs which would ordinarily arouse a feeling of threat are not interpreted as warnings by the members of the group because they conceive of them as normal in their specific situation. They are an expected, familiar feature of that situation and do not constitute the basis of a crisis. This was the case with ship fires in Texas City and with warnings of an impending cave-in at Picher. That this may happen even in the face of enemy action in wartime is indicated in Masuo Kato's description of the reactions of the people of Tokyo to the first few months' bombings:

> The initial bombings fell into a routine pattern that seemed so rigidly defined as to induce a false sense of security. People spoke of the bombers' "regularly scheduled service."[27]

When a new situation arises as the result of the impact of a disaster, familiar but legitimate signs of danger, and also pseudo-signals of threat, are seen in a new context. The previously existing expectation that life would go on as usual, that "it can't happen here," has suddenly been proved unreliable. As Sherif puts it:

> In critical times of danger and suspense, as during the tense period of an approaching or actual war, or life

[26] Op. cit., p 444.

[27] Masuo Kato, The Lost War (New York: Alfred A. Knopf, 1946), p 207.

> under an enemy power, or defeat, feelings of security become so precarious, nerves so jumpy, that even relatively minor incidents (which might be taken for granted in more stable times) may be sufficient to create collective panic and disorder.[28]

As in such critical times as these, the period following the impact of disaster is not a stable one. Stability has been violently destroyed, and people do not know what to expect next. Furthermore, they become highly suggestible along the lines indicated by the previous events. In Texas City, people were ready to believe rumors of new explosions and the spread of fires. In tornado towns, very few individuals thought of the danger of fire, although the danger actually existed. In a disaster situation, familiar events become ominous and the wildest rumors of new dangers seem reasonable.

As the foregoing suggests, one of the most significant things about subjectively experienced threat is that it is the greatest source of what is commonly described as "panic," particularly "panic flight." In Texas City, and in disaster towns described in secondary sources, it has been the fear of new dangers and not merely unreasoning horror at what has already happened which has caused precipitate, often unwarranted, flight and confusion.[29] In tornado towns, in a region where people know that tornadoes do not double back on their courses, such flight did not occur. Hadley Cantril says of panic:

> A panic occurs when some highly cherished, rather commonly accepted, value is threatened and when no certain elimination of the threat is in sight.[30]

LaPiere defines panic as "an effort on the part of the members of the situation to escape the presumed consequences of the crisis."[31]

[28] Op. cit., p 405.

[29] S. H. Prince, "Catastrophe and Social Change," Studies in History, Economics and Public Law, XCIV, No. 1 (1920-21). (New York: Columbia University, 1921) pp 26-31.

[30] Hadley Cantril, Invasion from Mars (Princeton: Princeton University Press, 1940) p 199.

[31] Op. cit., p 441.

He points out that it is also individual, uncoordinated action.32/ But it must be noted that it is not so much the "escape function" of panic, nor its uncoordinated aspect, that makes panic flight harmful in a disaster, as it is the fact that it is so often inappropriate and irrelevant. The significance of the relationship between threat and panic is that costly panic can best be prevented by the transmission to individuals of accurate information as to the sources of danger and as to appropriate action to escape any danger that actually exists.

IMMEDIATE REACTIONS OF INDIVIDUALS TO IMPACT

While the panic resulting from threat may have consequences which in themselves constitute a disaster, the interest here is in disasters arising from the impact of some unexpected, violent, physical force, with or without a preceding period of threat. Psychologically, the period of a few minutes immediately following the impact of this force is the real crisis in such a disaster, for it is then that the members of the group are confronted with a totally new, unstructured situation. It is the time of the first and most difficult, often fateful, decisions. Just how long this most critical period lasts is not fixed -- it may be seconds or minutes. In this analysis it will be placed in the context of the actions of individuals during the first 15 to 30 minutes after impact. One of the difficulties of fixing a definite time limit to the Period of Impact is the fact that perception of time is distorted in the crisis, and informants can only guess as to how long it took them to act.

The first reaction of individuals to a violent physical disaster, such as an explosion, has been described in all sources, both primary and secondary, as "stun." People in Texas City and the tornado towns spoke of being frozen into momentary immobility, of not knowing what had happened, nor what to do next. The shattering of normal expectations by an unexpected event presents the individual with an unstructured, undefined situation in which he does not know what to do. Prince spoke of this reaction at Halifax:

> The first of these phenomena was the "stun" of the catastrophe itself. The shock reaction at Halifax has been

32/ Ibid., pp 440f.

variously described. It has been graphically likened "to being suddenly stricken with blindness and paralysis." It was a sensation of utter helplessness and disability.[33]

LaPiere describes this reaction as "shock":

> The covert feeling-states of people before they become aware of a crisis will depend upon the type of the situation in which they are members. The occurrence of a crisis interrupts these feeling-states and results in shock, during which all behavior, overt and covert, is momentarily arrested.[34]

In the case of people who, although still conscious, have been subjected to physical force from falling, from being struck by objects, or from blast concussion, this shock may have some neurological basis. Medical research would be necessary to ascertain this. But in the case of those people who have been subjected to no physical force, the stunning effect is purely psychological and must be explained in terms of the unexpected, unstructured nature of the situation.

But the human being cannot act in terms of an unstructured situation, and Sherif has shown experimentally that the individual will find structure in a situation even if he has to create his own reference points.[35] Hence a situation does not remain unstructured for long. If the individual finds no reference points on the basis of which he can define the situation for himself, his first action will be to seek one. To observers the actions which take place at this time are likely to appear irrelevant and even irrational. In terms of the usual norms and standards of a stable situation, or in the light of later knowledge of what the situation was at the time, they may be irrelevant. But in terms of the limited knowledge available to the actor in the unstructured crisis situation, such actions may be highly appropriate. An extreme example of this principle is the case of a woman in Texas City who was in a lingerie shop trying on a girdle when the "Grandcamp" exploded. Although she was not actually in any danger and certainly was not dressed to appear on the street, she rushed

33/ Op. cit., p 36.

34/ Op. cit., p 445.

35/ Op. cit., pp 156-182.

out of the store in her underclothes to find out what had happened or, in other words, to seek a reference point for evaluation of the new situation.

Furthermore, since standard group definitions of the situation have broken down with the occurrence of the event precipitating the disaster and individuals are for the moment left to their own devices, it is not surprising that a wide range of individual reactions is found. The great variety of these actions, each perhaps seeming rational to the actor in his specific situation, adds to the impression of great confusion and irrationality. Social disorganization does exist, but it should not be mistaken for personal disorganization and irrationality. The fact that so few psychoses and neuroses resulted from the Texas City explosions is evidence that the disorganizing effect of impact on personality is not so great as the extent of social disorganization might suggest. In this connection, an observation made by Ernie Pyle after witnessing bombings in North Africa is relevant:

> The following figures aren't literal for any certain camp or particular bombing, but just my own generalization, which I believe a real survey would have authenticated. Let's say there was a camp of five thousand men, and they went through a dive-bombing and machine-gun strafing. One man out of that five thousand would break completely and go berserk. He might never recover. Perhaps twenty-five would momentarily lose their heads and start dashing around foolishly. A couple of hundred would decide to change trenches when the bombs seemed too close, forgetting that the safest place was the hole where they were. The four thousand seven hundred and seventy-four others would stay right in their trenches, thoroughly scared, but in full possession of themselves. They would do exactly the right thing.[36]

The important consideration here is what types of things give structure to the crisis situation for various individuals, or what reference points they use in determining what the situation is and what actions will be appropriate. In the first place, individuals evaluate their situations in terms of what knowledge is available to them -- in terms of what they can see. Thus it was

[36] Ernie Pyle, Here Is Your War (New York: The World Publishing Company, 1945), p 108.

found in the disasters investigated that people at first consistently tended to underestimate the extent of the destruction. This was particularly true in the Zone of Destruction where knowledge was most limited because of the physical effects of the disaster. Even further away from the point of impact, in zones where a broader view of the damage was available, people inside buildings underestimated the damage. This same reaction was noted even in Hiroshima after the atomic bomb had been dropped. A Japanese newspaper man walked towards the center of destruction shortly afterwards and noted:

> Everywhere ...people were searching for the site of the explosion, each convinced that a large bomb had dropped in the immediate neighborhood of his house. 37/

This tendency to assess the extent of the disaster in terms of the situation in the immediate vicinity may lead to uncoordinated, divergent and, in terms of the total situation, inappropriate action, but it also reduces the psychological shock to the individual and, in some cases, enables him to concentrate on his own predicament rather than worrying about others.

Until greater knowledge becomes available, there is also a tendency to define the situation in terms of expectations existing prior to the moment of impact. In Texas City and South Amboy many people first thought of explosions of furnaces in their own buildings or of potentially explosive industrial installations, such as the Monsanto plant. 38/

After recovering from the momentary stun of the disaster and making a guess as to what, in general, has happened, the individual tends to act in terms of those personal values which seem to be most threatened. What these values will be varies from zone to zone and from one limited, local situation to another. In the Zone of Destruction, it was found that it was the person's own life which was most likely to appear to be in danger. The first, immediate reaction was typically one of self-preservation. But of almost equal importance with the person's own life were the lives of other people in his immediate vicinity. As has been

37/ Kato, op. cit., p 219.

38/ J. B. Green and Leonard Logan, The South Amboy Disaster (Fort Lesley J. McNair, Washington: Operations Research Office, The Johns Hopkins University, 1950), p 16.

pointed out, in United States culture human life is a fundamental value, one which does not lose its significance even in disaster. It was found that even badly injured people acted to help others near them almost as readily as they acted to save themselves.

Outside of the Zones of Destruction and Heavy Damage, where large numbers of people were themselves injured or obviously threatened, the lives of primary group associates who might have been in danger were of primary consideration. Thus people tended to act in terms of finding, and if necessary, helping these people by rushing towards the places they were believed to be. Again, however, human life itself, no matter to whom it belonged, proved to be a compelling value. Many people rushing to find relatives felt impelled to stop in their search to help badly injured strangers whom they encountered.

People who are safe themselves, do not see the lives of others endangered, and who have no primary group mates to worry about, tend to base their actions on other considerations. Two factors were found to be significant as structuring elements for such people. One was personal property, which still retained some of its importance as a value in areas of light damage. The other was the recognition of a role which the person might play in the situation. Those who saw such roles for themselves were able to act quickly and surely.

Values considered important in normal times often decline in importance in a period of disaster. Property, both that of the actor and of other persons, loses some or all of its significance. Even in areas of light damage, storekeepers and pharmacists gave away their stock without accounting. In the Zone of Destruction, property values lost all importance so long as life itself was threatened. Norms of propriety also tend to break down. Denuded survivors gave no consideration to their lack of clothing, and other people regarded it as relatively unimportant that these victims were not "properly" dressed. Group and individual standards as to what the human organism can endure physically also break down. People forget what they usually consider their limitations. A graphic illustration is the case of an aged and lame man who was among the spectators when an oil tank exploded at Fairview, Oklahoma. He said, quite seriously:

> I ain't supposed to be able to run, but when that thing blew up I sure passed a lot of people that was running!

Finally, status and personal identity lose their importance in a disaster. Most informants declared that they worked with anyone who would help them or whom they could help. Frequently they could not even remember whose suggestions or orders they had followed in group action during the Period of Immediate Reaction. This disregard of usual status norms implies that a new basis of social organization comes into being in a disaster situation.

SOCIAL DISORGANIZATION AND REORGANIZATION

The coordination, harmony, and stability of social organization is possible only when there exists a set of mutually shared group norms, definitions, and expectations. The confusion and lack of coordination of individual activities following the impact of disaster are the result of the breakdown of these mutually shared norms and standards in an unfamiliar, unexpected situation. The impossibility of communication between the many members of a large group usually incident to physical disaster is the chief obstacle to the speedy re-establishment of widely shared, common understandings.

Momentarily such social disorganization may be complete. But in LaPiere's words:

> No aggregate of reacting individuals can, however, long refrain from interaction with one another, if for no other reason than that they are likely to come into physical contact with one another. Inevitably, therefore, the period during which the members of a group react as individuals is brief and is followed by some form of collective behavior.[39]

In the disasters studied, two types of collective behavior were found to emerge. One, seen in the headlong flight of spectators from Zone II in Texas City and in the individual escape of students from the BOQ, was a homogeneous, undifferentiated, mass flight from what was, or appeared to be, immediate and imminent danger. The other, more prevalent, type of reaction was partial social reorganization through small group formation.

[39] Op. cit., p 441.

The varied, discrete, and unrelated activities of a multitude of small groups may give the impression of confusion and total social disorganization. But small group organization is just as real as, even if less apparent and less formal than, large group organization. Since it is through small group formation that social reorganization emerges, the bases of this formation are important.

The fundamental factor determining membership in small rescue, relief, and escape groups was found to be physical proximity. People interacted with those nearby, without regard to identity. The only exception to this principle was that some similarity of motivation was necessary for such interaction. Hence small group formation was most prevalent in the Zone of Destruction, among survivors and rescue workers, all of whom shared the common motive of saving life.

The second basic factor in the formation of small groups was the sharing of a common situation. Faced with a common problem, such as escaping from a burning building or extricating a person trapped in debris, people spontaneously cooperated with one another in solving the problem.

Finally, informal structure -- leader-follower relationships -- developed spontaneously in such small groups. The leadership was not, however, of the type that LaPiere calls "regimental," the type that is popularly conceived of as "true leadership:" control of the situation by a person who individually determines the course of action and produces collective action by commands.[40/] It could be called, more properly, participant leadership: leadership by example and suggestion. In the still unstructured situations confronting such small groups, the persons who had the knowledge and capacities appropriate to their specific situations became leaders, and other people in the same situations followed them readily. Their "commands" could be tacit, nothing more than "taking hold" of a task in a manner that made evident to others what needed to be done.

Particularly important as leaders of this sort were "role persons" who, by their relatively prompt, decisive action, became the nuclei for the formation of small, task groups. Having some

40/ Ibid., pp 105-109.

conception of what might be done, and proceeding to do it, they drew to them the more suggestible people nearby who wanted to do something but did not know what to do.

But there are obvious limits to the effectiveness of an aggregate of discrete, unrelated, small groups. While each might be highly effective in dealing with the limited problem confronting it, cooperation for the performance of larger tasks and the systematization of work can come only through the incorporation of these groups into a larger social organization.

It was found that such organization resulted from the bringing together of these groups and the coordination of their separate efforts by a leader with the qualifications appropriate to the task. These qualifications were the possession of greater knowledge of the over-all situation than any of the small group leaders could possess, and the possession of means of communication by which this knowledge could be transmitted to a large number of people. An alternative way in which large-scale organization was introduced into disaster situations was the entry of already organized groups under established leaders, such as a police force not involved in the disaster. Obviously, large-scale reorganization cannot take place through either of these means until the lapse of sufficient time for leaders to estimate the situation and obtain means of communication, or for outside forces to reach the scene of the disaster. Hence it may be concluded that an initial stage of small group organization and activity is inevitable. How long this stage will last is dependent to a large extent upon the solution of problems of communication.

COMMUNICATION IN DISASTER

The first and most obvious problem of communication which arises in a disaster situation is that of transmitting appeals for assistance to groups outside the disaster area. In most of the disasters studied this problem was solved quickly although fortuitously, as a result of the fact that perhaps one long-distance line remained intact. In Woodward the arrival of outside aid was delayed by the inability of the stricken group to send out an immediate appeal. Provisions for emergency means of outside communication could easily be guaranteed in advance of disaster in any group.

The speed with which reorganization takes place is largely dependent upon the availability of means of communication to the mass of people within the disaster area. The only effective means found to have been used is public address systems. Obviously, if they are to be used they must be a standard part of disaster equipment, along with emergency sources of power, and they must be available in accessible, previously designated places. Furthermore, the means of communication, to be effective, must be kept under responsible control. Agencies transmitting reports to points outside the disaster area should also be controlled, for untrue announcements may find their way back into the disaster area. If communications facilities are not rigidly controlled by leaders with accurate knowledge of the situation, they may become the purveyors of false and contradictory rumors.

Rumors during disasters were found to fall into two categories: (a) exaggerations of the extent of destruction and loss of life; and (b) reports of new, imaginary threats. The latter are more harmful within the disaster area itself, for they are sources of panic and obstacles to reorganization. The dangers of the former lie in the effects on morale within the area, and in the exaggerated picture of the requirements of the situation which is presented to people in peripheral areas. In connection with this last point, control of all appeals for outside assistance, throughout a disaster emergency, is essential to the reduction of confusion resulting from the pouring in of more assistance than is needed or can be effectively coordinated.

Mechanically efficient means of communication are most effective only when accurate information is available for transmission. In Texas City, authorities were not sure what orders to issue while the "Highflyer" was burning because of inability to assess the amount of threat that it represented. In all the disaster towns confusion resulted from the inadequacy of knowledge as to who had been killed and where the injured had been taken.

Part of the problem of communication in a disaster is the need for accurate information as to the needs for supplies, equipment, and personnel. Even after such information is obtained and transmitted to outside sources, agencies are needed for channeling the incoming aid to the places where it can be most effectively used. This need was particularly evident in the problems of organization of medical services in various disaster towns.

Finally, the best antidote against panic and social disorganization is the transmission of as much accurate information as is available, and as quickly as possible, to as many people in the disaster situation as is possible. For this purpose, both responsibly controlled public address systems and conveniently located information stations have been found necessary.

PRINCIPLES OF EMERGENCY ADMINISTRATION

During the Period of Emergency, after the development of large scale organization and of formal leadership, conflicts between the leaders in various phases of the disaster work may arise. It seems that adherence to two basic principles of emergency administration might preclude the development of such conflicts.

The first of these principles follows from the fact that emergency administration takes place in a context of abnormal tension and urgency, and that a number of different activities, all of an unusual, "emergency" nature, go on simultaneously. Although the group has moved from initial complete social disorganization towards greater organization, it is not as well organized and the situation not as well structured as in normal times.

This first principle is that the most effective type of leadership is a coordinating, and not a regimental, leadership. In a disaster, the multiplicity of tasks and the difficulties of communication make effective centralized direction impossible; a division of labor is necessary. Too much concern for formal authority and for "channels" tends to create friction and wasted motion. It also contributes to poor morale by undermining public confidence in some important leaders and their agencies. The most effective over-all leader is one who coordinates the activities of various task groups and implements their efforts by seeing that they receive necessary information, supplies, and personnel.

The second principle is that agencies coming into a disaster area from other areas can be most effective if they work with a minimum of publicity and at least appear to work through local leaders and agencies. When the people who have experienced a disaster constitute a social unit such as a community, their in-groups attitudes are strengthened by the common experience. In

addition, the fact that they have undergone such an unusual experience gives them distinction in their own eyes and in the eyes of other people, as the attention they receive in the press indicates. Any outsider who appears to be seeking to gain prestige for himself or his organization is suspected of seeking to detract from the newly gained status of the in-group, and of being present not simply to help but also to profit. The factors of greater public acquaintance with and confidence in local leaders, and of these leaders' more intimate knowledge of the area, its people, and its culture, are also important. This is particularly important for rehabilitation activities. The fact that the Red Cross channels rehabilitation funds through local committees indicates its recognition of this principle.

REHABILITATION

During the periods of Impact, Immediate Reaction, and Emergency there is a tendency for people, particularly those in the greatest need, to underestimate and deprecate their own requirements for assistance. In all the disasters investigated there were numerous stories of how seriously injured people insisted, "Help the others -- they're in worse shape than I am." But during the Period of Rehabilitation this attitude changes to one of demanding all that is needed, and frequently more. Rehabilitation agencies are therefore faced with a dilemma when they assume the task of recouping people's losses.

In making public the fact that aid is available, and in actually helping people, they, at the same time create in the group the feeling that they should get their fair share. A demanding attitude is induced in the group that regards itself as the object of special consideration. They come to expect, not merely to appreciate, aid. This attitude is especially liable to develop when it appears that some people are getting more assistance than they deserve and charges of favoritism are being voiced.

In this context, attempts to assess actual needs by careful investigation become extremely important. But these very attempts give the impression of reluctance to grant assistance. This problem therefore demands: (a) a reduction of the time and machinery involved in the distribution of rehabilitation funds to the minimum necessary for efficiency, and as much concealment of

the remaining machinery as is possible; and (b) a constant education of the disaster group in the principles and methods of rehabilitation being employed. Finally, careful assessment of the combined needs of the group, and coordination of rehabilitation efforts (especially the collection of funds), may prevent the creation of an apparent or real overabundance of available aid. Such overabundance contributes greatly to the development of an attitude of dependence in the stricken group.

PLANNING FOR DISASTER

Although it is not the object of this study to devise a plan for civilian disasters, certain general principles of disaster planning may be stated on the basis of the findings.

Though it seems to be a truism, it should be emphasized that flexibility should be the primary characteristic of a disaster plan, since a disaster is by its very nature unexpected. It seems impossible to predict exactly what is going to happen in any disaster, and a plan should provide for as many eventualities as are conceivable. Alternate locations for installations, alternate facilities for communication, and alternate personnel for key positions should be available, for there is no way of predicting who or what will be lost at the moment of impact. A wide degree of latitude in individual reactions during the Periods of Impact and Immediate Reaction should also be anticipated. But in any case, the initial disorganization and a gradual reorganization through small group formation seem inevitable.

In order to reduce disorganization, facilitate the process of reorganization, and provide for the performance of essential tasks, a disaster plan should include the designation of roles for as many of the members of the group as is possible. For the majority of the members, these roles may be insignificant. But they should help to maintain public interest in the plan and provide a structuring element for the individual when confronted with actual disaster.

A disaster plan should also be broad in areal scope, including both the areas which are expected to be central and those expected to be peripheral. The importance of peripheral areas varies directly with the magnitude of the disaster. Advance planning of the roles of groups in these areas, and of their coordination with agencies in the disaster area, are essential.

Division of labor and the decentralization of authority and responsibility should be incorporated as a part of the plan. The "disaster director" should be regarded by himself and his lieutenants as a coordinator more than as a commander. The persons, both principals and alternates, designated to be in charge of various aspects of disaster work should expect to assume responsibility for their respective assignments without waiting for orders from the director. The director should anticipate that he cannot possibly know enough about every phase of the disaster situation to direct them all personally.

Communications seem particularly amenable to advance planning. Emergency communications facilities should be maintained on a standby basis. In addition, members of the group should be educated as to what facilities will be used in a disaster and how to distinguish authorized from irresponsible sources.

Finally, any group seeking to plan effectively for disaster should maintain an up-to-date inventory of disaster supplies and equipment. But to have available such items as emergency generators, temporary shelter (such as tentage), searchlights, wrecking and construction equipment, and medical supplies is not enough. It is equally important that every person who might be in a position to use one of these items should know where it will be if disaster strikes. After the tornado struck, the people of Holdenville discovered that they had far more disaster equipment available than they knew, but it was fortuitous that someone brought this equipment into use. The town's new disaster plan includes an inventory of such equipment, showing the location of each item and giving the identity of personnel qualified to operate it.

THE MILITARY PROBLEM

Broadly defined, the ultimate objective of this study is to make extrapolations from the behavior of civilians in non-atomic disasters to that of soldiers under atomic attack. This process of extrapolation must consist of the estimation of the possible significance for the military problem, of the conclusions summarized under the heading, "Civilian Reactions to Disaster." This requires, in turn, the statement of assumptions about the physical effects of an atomic attack and the subjective factors affecting soldiers' reactions.

ASSUMED CONDITIONS OF ATOMIC ATTACK

Available information as to the effects of an atomic bomb on materiel and personnel is based on data obtained from the explosion of bombs releasing energy equivalent to about 20,000 tons of TNT.[41] A height of 2,000 feet above ground zero is assumed by the Atomic Energy Commission to be the optimum height at which an explosion will cause a maximum of destruction.[42] For the purposes of this study, it is assumed that an atomic bomb used as a tactical weapon would be such a nominal bomb, exploded in an air-burst at 2,000 feet, over one of two types of targets: (a) Troops in the Combat Zone organized laterally and in depth for a mission of attack or defense; or (b) troops and installations in the Communications Zone, with a logistical mission of supporting combat units with supplies, services, and personnel replacements.

It is assumed, further, that atomic attack against combat zone troops would have as its purpose preparation for ground offensive

41/ US Atomic Energy Commission, Damage from Atomic Explosion and Design of Protective Structures (Washington: Superintendent of Documents, US Government Printing Office, 1950), p 5.

42/ Ibid., p 7.

action, exploiting disorganization created by the bomb. Bombing of areas in the Communications Zone would, it is supposed, have as its purpose interruption of the flow of supplies, services, and replacements to combat troops. This would include the bombing of troops concentrated in assembly areas preparatory to the launching of an offensive.

ASSUMED PHYSICAL DAMAGE 43/

Atomic Energy Commission studies indicate that a nominal atomic bomb would create a zone of complete materiel destruction within a radius of about 2,500 feet from ground zero. In diameter this zone would thus be almost a mile, as compared with the 3,000-foot wide Zone of Destruction in Texas City. There would be severe damage, and some total destruction, within a radius of a mile from ground zero, and moderate and partial damage would extend to the two-mile limit. In Texas City, the Zone of Light Damage began at a distance of 5,000 feet from the center of the explosion. The much greater magnitude of the effects of an atomic bomb than that of any of the disasters studied here is evident.

ASSUMED MEDICAL EFFECTS

Similarly, casualties would be far more numerous and would be distributed over a much larger area. While deaths would be total only within a few hundred yards from the point of the explosion, 80 percent mortality could be expected at a distance of 3,000 feet from ground zero. 44/ Deaths could not be expected to fall below 50 percent until a distance of 5,000 feet, nearly a mile, from the center was reached. 45/ Some deaths might be expected almost a mile and a half from the center. In Texas City deaths were rare beyond 2,000 feet and there were none beyond 3,000 feet. The mortality rate after an atomic explosion might be as high at a distance of 5,000 feet from ground zero as it was at a distance of 1,000 feet in Texas City. Conversely, medical effects

43/ US Atomic Energy Commission, The Effects of Atomic Weapons (Washington: US Government Printing Office, 1950), pp 133-136.

44/ Ibid., Fig. 12, 15, p 376

45/ Ibid.

as mild as those found beyond 3,000 feet in Texas City would not be found after an atomic explosion until an area nearly two miles from ground zero was reached. Lacerations were received as far as 10,600 feet from ground zero in Hiroshima, and burns were received out to 12,200 feet in Nagasaki.[46]

As in Texas City, a major cause of death and injury would be blows from collapsing structure or flying debris.[47] To this would be added another dominant cause which was of only minor importance in the peacetime explosion, burns from thermal radiation or secondary fires. Radiation would not, apparently, be a dominant cause of death. Furthermore, many of the deaths caused by radiation would not occur until hours, days, or even weeks after the explosion.[48]

PROBABLE DANGERS ARISING SUBSEQUENT TO IMPACT

Contrary to widespread popular beliefs, the central Zone of Destruction created by an air-burst would not be dangerously contaminated with radioactive materials.[49] While there would be some radioactivity, other dangers would be of much greater significance. In the Combat Zone, assuming an air-burst designed to destroy but not to contaminate the central zone, there would be great danger of attack by enemy ground forces. A second source of danger would be fires, especially in wooded or built-up areas. Thermal radiation started fires up to 3,500 feet from ground zero in Japan.[50]

SUMMARY OF ASSUMED PHYSICAL EFFECTS

It appears, therefore, that an atomic attack of the type assumed here would create a "Zone of Destruction" with a radius of 3,000 feet from ground zero, with a diameter of a mile or more. Within this zone, virtually all buildings and equipment would be destroyed. There would be a small minority of survivors, but

46/ Ibid., p 336
47/ Ibid., p 334.
48/ Ibid.
49/ Ibid.
50/ Ibid., p 215.

they would be scattered throughout the area and would be surrounded by the dead and dying. Danger from radioactivity would be negligible, but all combustible materiel would be in flames. The area and the few living people in it would be defenseless against ground attack by properly trained and equipped enemy troops.

Surrounding the Zone of Destruction in this area would be a "Zone of Extensive Damage," between 3,000 feet and 10,000 feet from ground zero. Damage to structures and equipment would range from severe to moderate, depending upon distance from ground zero, type of structure, and type of material. There would be many deaths and serious injuries in this zone, and though the majority of the people in the zone would still be alive, a major medical problem would be presented. There would also be fires originating from overturned stoves, electrical short circuits, broken gas lines, and perhaps from petroleum and ammunition dumps.

A "Zone of Light Damage" would begin about two miles from ground zero. Only at this distance would damage to materiel and injury to personnel be of such a minor nature that the psychological effects of being subjected to atomic attack would be the major determinant of the troops' reactions.

SUBJECTIVE FACTORS AFFECTING REACTIONS OF SOLDIERS

Certain assumptions as to the subjective factors which might affect the reaction of military personnel to catastrophe must be stated before predictions of probable reactions to atomic attack are attempted. In the first place, it must be assumed that human life, per se, is of less importance as a motivating value in wartime military groups than in peacetime civilian groups. The preservation of human life, no matter whose, will still remain a strong cultural value for United States troops, but its sacrifice in the furtherance of a tactical or logistical mission is expected in a military situation. A civilian community, as a group, has no other mission than the maintenance of life at an optimum level of comfort and convenience. When disaster strikes, the mission of the peacetime, civilian group becomes the minimization of the loss of life and the restoration of normal comforts and conveniences. A military unit has a mission which must be carried

on at the cost of inconvenience, discomfort, and even the loss of life. In other words, it must be assumed that a well-trained soldier will, even in a disaster situation, place accomplishment of his mission ahead of the saving of his own life or the lives of others.

Motivation of military personnel is not quite so simple as this implies, of course. While the outcome of the conflict cannot be predicted, it must be assumed that the motive of carrying out the military mission will be in conflict with two other motives. One is the individual's desire to save his own life. The other is concern for the lives of primary group associates.

An important difference between a civilian and a military situation, however, is that in a military disaster primary group associates are likely to be together, whereas in a civilian disaster they are usually scattered. The men with whom the soldier sleeps, eats, plays, and forms friendships tend to be the same men with whom he works. Furthermore, the primary group is likely to be a formally designated team, such as a squad, with a mission which is an integral sub-part of the mission of the larger secondary group of which the team is a part. In some situations at any rate, saving the lives of primary group associates may further, rather than hinder, the accomplishment of the mission.

It is to be expected that in a military situation property will be of little significance as a motivating factor. The soldier will not feel the same concern for government property that the civilian feels for his own house or place of business. The only property which might have a compelling value for the soldier is equipment essential to the accomplishment of his mission, such as arms and ammunition.

Differences in the past experience of the soldier and the civilian must be assumed. It is not to be expected that the soldier will have had experience in atomic attacks, but he will have experienced non-atomic bombings. Combat zone troops will, of course, be more likely to have had this sort of past experience than will communications zone soldiers. It may be expected that all military personnel will have as part of their past experience more training in recognition of, and protective action against, disaster than had the civilians studied in this research. On the other hand, part of this training may consist of warnings of the

likelihood of atomic attack, so that any unusually large explosion may be suspected of being an atomic blast. This reaction is already appearing among civilians in American cities as a result of "war jitters."51/

The soldier's definition of what is normal to his situation will also differ from that of the civilian. For combat troops, death and violence will be more or less normal and not as unexpected and shocking as they are to the civilian. Depending upon the amount of enemy air activity, this reaction will vary for rear echelon troops. Alerts and actual air raids may be such a normal, expected part of the soldier's life that carelessness may be the result, particularly if the individual has escaped harm in previous air attacks. Residents of Hiroshima, for example, accustomed to flights of reconnaissance planes over their city, were not alarmed by the aircraft carrying the atomic bomb.52/

Unlike the civilian, the soldier also includes as part of his definition of the normal a patent system of rank and authority. He is accustomed to receiving and obeying peremptory orders. The unfamiliar controls which confront the civilian in time of disaster, such as the need for a pass to go to and from his own dwelling, are normal for the soldier.

The final difference in the subjective factors of a military situation, as distinguished from the civilian, is the fact that every soldier is trained for a role which he is supposed to follow in any case. Even though his usual, primary assignment may be inappropriate to a disaster situation, he will have alternate responsibilities and capabilities which he is trained to assume and to use in case of disaster. Thus a man who may be a clerk-typist in a headquarters will know that he is supposed to become a rifleman, a messenger, or an ammunition bearer, in the event his headquarters comes under enemy attack. Many civilians, on the other hand, have no clear conception of what they can or should do in a disaster situation.

Against the background of these assumptions as to the objective and the subjective factors which may affect the reactions of military personnel to atomic attack, prediction of these reactions may be undertaken.

51/Green and Logan, op. cit., p 15.

52/John Hersey, Hiroshima (New York: Alfred A. Knopf, 1946), p 8.

REACTION TO THREAT

It might seem that for soldiers the Period of Threat before an atomic attack would be longer than that for civilians before a peacetime explosion, because of superior warning equipment, such as radar, and more thorough training in recognition of warning signs. But it is doubtful that soldiers will ever know whether an impending air attack is going to be "ordinary" bombing or an atomic attack. Familiarity with ordinary bombings, producing less widespread and less nearly complete destruction and loss of life, is likely to produce a false sense of security which would be extremely costly in case of actual atomic attack. Cover which might be adequate protection in an ordinary bombing might be useless under atomic attack. To soldiers accustomed to attack by mass flights of enemy aircraft, a few planes or a single guided missile might occasion no alarm; yet one might carry an atomic bomb.

Obviously, the atomic bomb would be of most tactical value as a weapon of surprise. It could seem that constant alertness to every sign of a potential atomic attack would solve this problem, but this sort of "jumpiness" could easily interfere with the accomplishment of the normal mission of a unit. A graduate student at the University of Oklahoma, an Army captain in World War II, tells how the men at a port installation in India became panic stricken at the approach of any aircraft, even friendly, after a surprise bombing. Assuming that such a state of constant alertness is preferable to exposure to the dangers of surprise attack, constant training and admonition would be necessary to maintain such a state.

The best preventative against threat-induced panic would be thorough training in individual methods of protection against the effects of an atomic explosion. The actual effectiveness of such measures in preventing death or serious injury would vary with distance from the point of impact, but confidence in his ability to take such measures would serve an important psychological purpose for the individual. Essential to the establishment of the self-confidence would be the possession of accurate knowledge as to the probable effects of an atomic explosion. Any exaggeration of its already terrifying effects would only contribute to the development of panic.

IMMEDIATE REACTION TO IMPACT

It is assumed that, in the event of actual atomic attack, the patterns of reaction of persons in the various disaster zones would be similar to those of civilians in corresponding zones, modified only by the objective and subjective factors assumed to be peculiar to the military situation. Thus it may be expected that momentary stun would be the first reaction of all survivors within several miles of the point of the attack. In the Zones of Destruction and Extensive Damage this stun would be even greater and more lasting than in corresponding civilian zones because of the greater blast effects. In these zones, many cases of severe medical shock could be expected.

The next reaction would probably be an underestimation of the extensiveness of the damage. This reaction has been noted in the civilian disasters described, and was also found at Hiroshima.[53] The amount of underestimation would be less than that after the first atomic bombing, however, for a weapon of such destructiveness was unknown and inconceivable to the residents of the Japanese city.[54] As soon as soldiers realized that they had come under atomic attack, they would envision far greater destruction than they would be able to see. But they would still react primarily in terms of what they could see in their immediate vicinity.

Due to the extensiveness of the areas of destruction and damage created by an atomic bomb, structuring of the situation would be more difficult for the individual than it is in a civilian disaster of lesser magnitude. Without information from some central intelligence agency, it would be difficult for the soldier to determine how extensive the damage was, where the center of the explosion was, and what zone he himself was in. Training in the recognition of signs helping to answer these questions would be of considerable value.

Because of the mutually supporting functions of military units, the desire of the soldier to know the fate of other units than his own would be intensified. Attempts to determine just what has happened to the platoon, company, and larger organizations to

[53] Hersey, op. cit., pp 9, 18, and 21.

[54] Ibid., p 32.

which he belongs, would prolong disorganization and interfere with the pursuance of the military mission. For commanders, an estimate of the situation would be necessary to further operations. Because of the great importance to the individual and to the group of the need to structure the disaster situation, and of efforts to do so, predictions as to how it might be structured are needed.

In the Zone of Destruction, where only a small minority of persons would still be alive and conscious, structuring elements would be the desire to save one's own life and the lives of others in the immediate vicinity, just as in a civilian disaster. The complete destruction of equipment and the extremely high number of casualties that would be evident would make it obvious to the scattered survivors that their mission could not be accomplished. Fires would threaten the lives of those who had survived the blast, and the desire to escape from a hopeless and dangerous situation would be the predominant factor in determining reactions.

In the Zone of Extensive Damage, fires, damage to equipment, and the large number of casualties, would make panic flight likely. To the real danger of fire might be added the imaginary danger of radioactivity. Many men in this zone might even think they were in the Zone of Destruction. Yet panic would not be universal in the Zone of Extensive Damage. As the severity of damage and injury would vary from locality to locality within this zone, so also would individual and group reactions.

Here and there small group formation and reorganization would take place, first for the purpose of saving lives, later for the resumption of the mission of defense. The newly formed groups would, in most cases, consist of men from many shattered organizations. Many of the leaders would be emergent leaders who had had no formal position of leadership before the attack. Individual capacity to contribute to the solution of the immediate, pressing problem would be more important than formal rank in determining leadership.

Even after such small groups were formed, there would be little coordination between their separate activities. Scattered, hastily organized strong points might offer temporary resistance to enemy ground forces, but there is no indication that effective resistance to attack could be presented by the survivors in this

zone without immediate reinforcement. Virtually no aid could be expected to go from this zone into the Zone of Destruction, unless specially trained forces, maintained on a stand-by basis under special protective cover, were available.

Only in the Zone of Light Damage, beginning two miles from ground zero, would reorganization of units for the purpose of the accomplishment of the tactical or logistical mission be the predominant reaction. The conflict between concern for human life and concern for the mission would probably be no greater than in an ordinary combat situation in which casualties occur. The greatest problem in this zone would be the dilemma of commanders responsible for the assignment of subordinate units to one of three possible tasks: (a) Continuation of their normal assignments in the Zone of Light Damage; (b) assumption of a mission of defense in the Zone of Destruction or the Zone of Extensive Damage; and (c) assumption of a mission of rescue in one of these two zones.

In a civilian disaster, the primary concern of leaders, established or emergent, in this outer zone, is for the direction of rescue work towards the Zone of Destruction. The great majority of the people who hasten to the central zone, either as individual volunteers or as members of organized rescue groups, go there for the sole purpose of rescue and relief work. The diversion of a large number of troops to such a mission of mercy in a military disaster would endanger the tactical or logistical mission which is of primary importance. On the other hand, failure to dispatch sufficient troops to the helpless Zone of Destruction and the virtually helpless Zone of Extensive Damage would leave a large hole in the line, open to aggressive enemy action. In the Communications Zone, it would result in a prolonged interruption of the flow of essential supplies and services.

The breakdown of usual norms as the result of an atomic disaster would have important military consequences, especially in the Zone of Extensive Damage. As has been pointed out before, emergent leaders with characteristics appropriate to the situation would become more important than established, formal leaders. More important still, the lack of concern for personal identification that results from the urgency of a disaster emergency would increase the danger of infiltration by enemy troops.

DISORGANIZATION AND REORGANIZATION

In the Zones of Destruction and Extensive Damage small group formation and reorganization would quickly take place, as has been suggested before. In this reorganization, established organizational lines would largely disappear and most of the groups would be composites of the remnants of several badly decimated units. But in the Zone of Light Damage established organizational lines would as a rule be followed.

The major problem of large-scale reorganization would develop in the Zone of Extensive Damage. Coordination of the actions of many scattered small groups and the effecting of large-scale reorganization would depend largely on the adequacy of intelligence and communications services. The designation of emergency missions for units in the Zone of Light Damage would also depend upon the adequacy of these services. Speed in reorganization, though essential, would be difficult to achieve because of the extensiveness of the areas of disorganization.

COMMUNICATIONS

The problems of communication in a military disaster are of the same type as those in a civilian disaster, but of much greater magnitude. Everywhere the desire for accurate knowledge of just what had happened would be great, and the ground would be fertile for rumors. Just as in civilian disasters, public address systems would be useful for disseminating authentic information, to bring structure to the situation and to counteract false reports. Rumors exaggerating the extent of the damage would be rife, especially in the Zone of Light Damage, and, if not counteracted, they would be extremely detrimental to the morale of units which, though not destroyed or disorganized themselves, might fear that adjacent or supporting units important to their security had been wiped out. Such rumors might even be disseminated by an alert enemy. Hence, just as in a civilian disaster, responsible control of media of mass communication and the provision of means for identifying authentic sources of information would be essential. Prearranged code identifications might be used to advantage.

Assuming the availability and the responsible control of facilities for communication, these facilities would be of little value

unless the commanders controlling them had adequate intelligence as to both the tactical and the logistical situation. Speedy and accurate assessment of the requirements in various areas for rescue workers, combat reinforcements or replacements, and supply and service personnel, would be essential to prevent the costly diversion of more troops and equipment than necessary. The channeling of information from all intelligence sources into a central intelligence agency would contribute to the speed with which an accurate estimate of the situation could be made.

PROBLEMS OF EMERGENCY ADMINISTRATION

As large-scale reorganization emerges in a military disaster area, the re-establishment of normal command channels would be desirable wherever possible. But since several major headquarters would undoubtedly be concerned with this reorganization, the principle that coordination is more important than assertion of authority remains valid. It would be difficult to ascertain which of several headquarters was in the best location for the collection of intelligence and the coordination of activities. Dual command would not be advisable, but conflicts of authority could be costly. Commanders on all levels would need to be ready to accede to the authority and judgment of other leaders, established or emergent, if they seemed to have better intelligence or better control of the situation.

The problem of the relationship of "insiders" and "outsiders" would appear in the form of conflicts between rear echelon personnel and the survivors of any of the three disaster zones. The magnitude of an atomic disaster would present a temptation to high commanders far removed from the scene to assume absolute control of an apparently completely disorganized situation. From the observation of civilian disasters, it would seem that leaving control of the disaster area in the hands of available local commanders or, at least, issuing directives through them, would have two desirable effects. In the first place, it might reduce antagonism and loss of morale arising from unpopular orders demanded by the extremity of the situation. Secondly, it would contribute to the maintenance of morale by minimizing the impression of complete disorganization which the appearance of new commanders might create.

PROBLEMS OF REHABILITATION

What the psychological effects will be, of the vast volume of recent literature portraying the atomic bomb as a virtually irresistible weapon, is difficult to estimate. It is quite likely, however, that both civilians and soldiers who undergo atomic attack will tend to regard themselves as deserving of special consideration, consideration greater than that accorded the victims and survivors of more prosaic forms of attack. Aside from the tremendous logistical problem that an atomic attack would pose, the minimization of this attitude might prove to be the main consideration in rehabilitation efforts. Except where medical findings indicate the need, men who survive atomic attack should be dissuaded as far as is possible from any belief that they deserve to be relieved of further dangerous duty. The restoration of esprit de corps and a feeling of self-sufficiency to reorganized units will be essential if unnecessary and costly losses of manpower are to be avoided.

APPENDIX A

SCHEDULE FOR TEXAS CITY AND TORNADO TOWNS

SCHEDULE FOR TEXAS CITY AND TORNADO TOWNS

1. How did you first find out about the disaster?
   When?
   Where?
   Whom were you with?
   What were you doing?

2. How did the knowledge that there was, or might be, a disaster make you feel?

3. (If you did not know) what did you think was going to happen?

4. What did you do when you found out about the disaster?
   Why do you think you did this?
   What did you notice other people doing?

5. Did you talk to anyone else at this time?
   What was said?

6. When the (disaster) actually "struck," what were you doing?
   How did the (disaster) appear to you?
   Were you injured?
   Did you see anyone else injured? How did this make you feel?
   When did you feel that "the worst was over?"
   Did you expect anything more to happen? Why?

7. How did you feel immediately after the worst seemed to be over?
   What was the first thing you thought of?
   What was the first thing you did?
   What were other people doing?
   How did what they were doing affect you?

8. After this, what did you do?
   What worried you most?
   Did anyone tell you, or suggest to you, what to do?
   Did you follow this person's suggestions? Why?

9. Who do you feel helped you, personally, the most, during a after the disaster?

10. Who do you feel was of the most service to the community?
    What did they do?
    Why do you think they did this?

11. Did you see anything done that you felt was harmful, or should not have been done? What was it? Who was doing it?

12. During the disaster, where did you get the information as to what was going on?
    Do you feel that the information you received was reliable?
    Did you hear any rumors during the disaster?

13. What do you think you'd do if you thought something like this were about to happen again? If it did happen?

APPENDIX B

SCHEDULE FOR BOQ FIRE

SCHEDULE FOR BOQ FIRE

1. How did you first find out there was a fire?
   Where were you?
   What were you doing?
   About what time was this?

2. How did the fire appear to you at first?

3. What was the first thing you thought of?
   What did you do?
   How did you get out of the building?
   After you got out, what did you do?

4. What were other people doing during the fire?
   How did their actions affect you?
   Did you see anyone else doing anything that you think was irrational?
   (If yes) What were they doing? Why do you think it was irrational?
   Do you think that your own actions were rational?

5. At any time did anyone suggest to you what to do?
   Did you follow their suggestions?
   Why?

6. Did anyone help you in any way while you were still in the BOQ area?
   In getting out of the building?
   After you got out of the building?

7. Did you see any of the counsellors:
   During the fire?
   Immediately after the fire?
   (If no to preceding question) When was the first time you saw any counsellors after the fire?

Which ones did you see?
What were they doing?

8. During the fire, did you see any of the boys from the BOQ working together?
(If yes) What were they doing?
Did anyone seem to be in charge of the group?

9. What did you do for the rest of the night?
How did you feel?

10. What did you do Saturday? Sunday? Monday?

11. How did you feel Saturday? Sunday? Monday?

12. When do you feel that you had completely gotten over the effects of the fire?

13. What sort of social groupings were there in the BOQ before the fire?

14. How did the fellows in the BOQ get along with the ones in Bldg. 164 before the fire? After the fire?

15. Who helped you after the fire, financially or otherwise?
What do you think of the way in which this aid was administered?
Have you heard any criticism of the way in which it was administered?

16. Were there any boys who either gained or lost as a result of the fire?
(If yes) What did they do?

17. Was there much discussion of the fire among the BOQ fellows after it was all over?
(If yes) For about how long?
What, specifically, were these discussions about?

18. Do you have any idea as to what caused the fire?

19. Did you feel any hostility towards any person or group after the fire?

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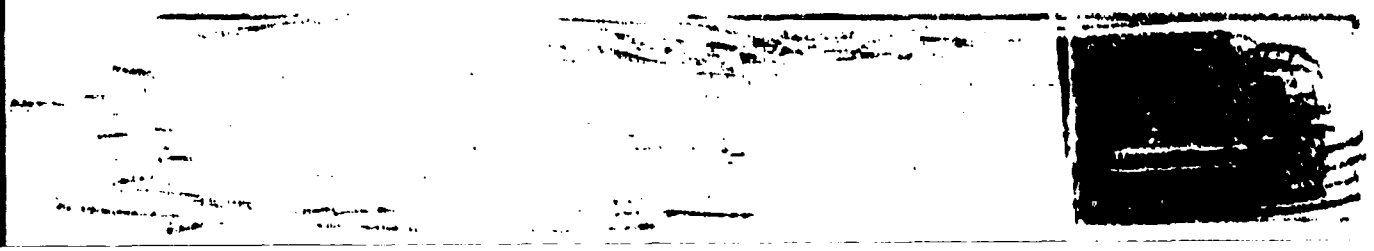

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